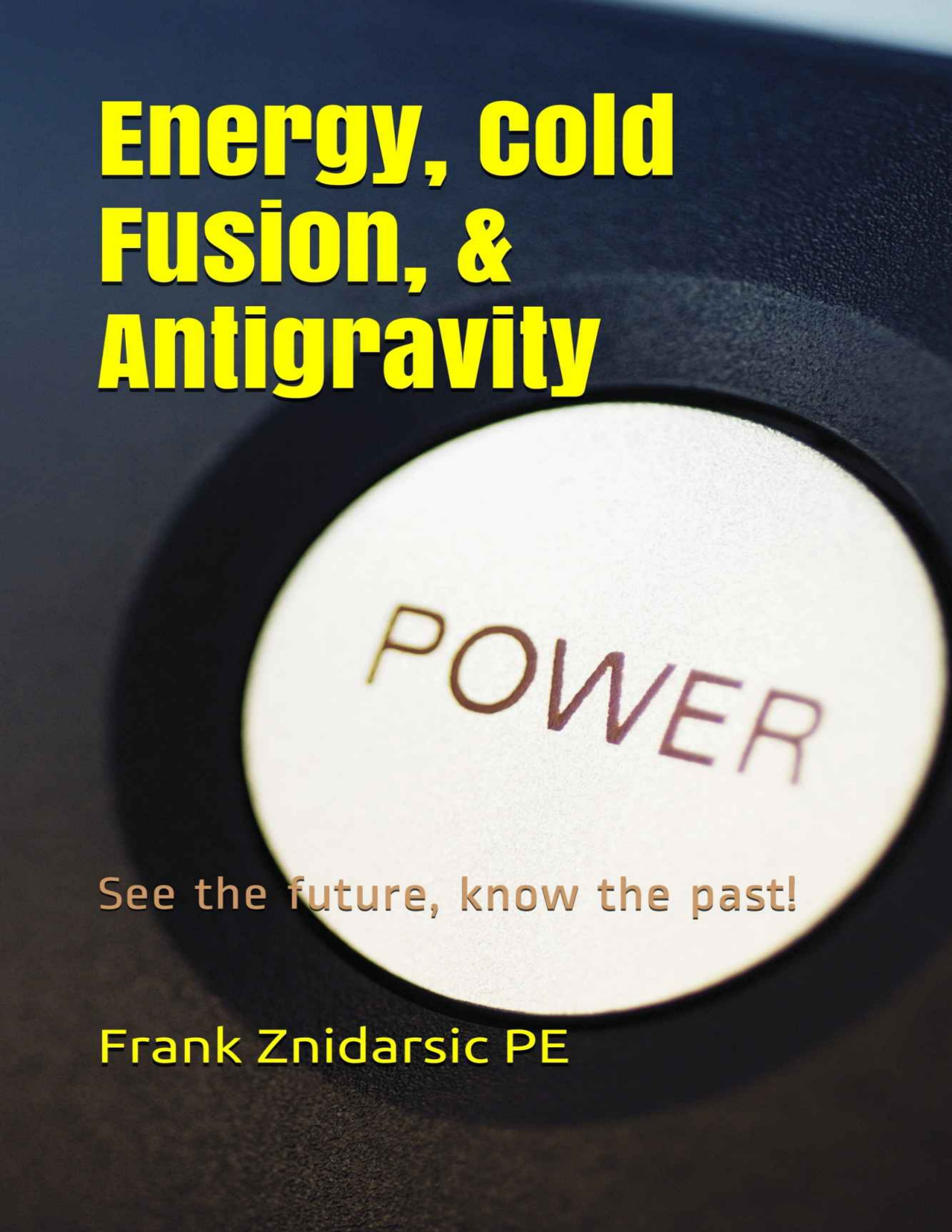
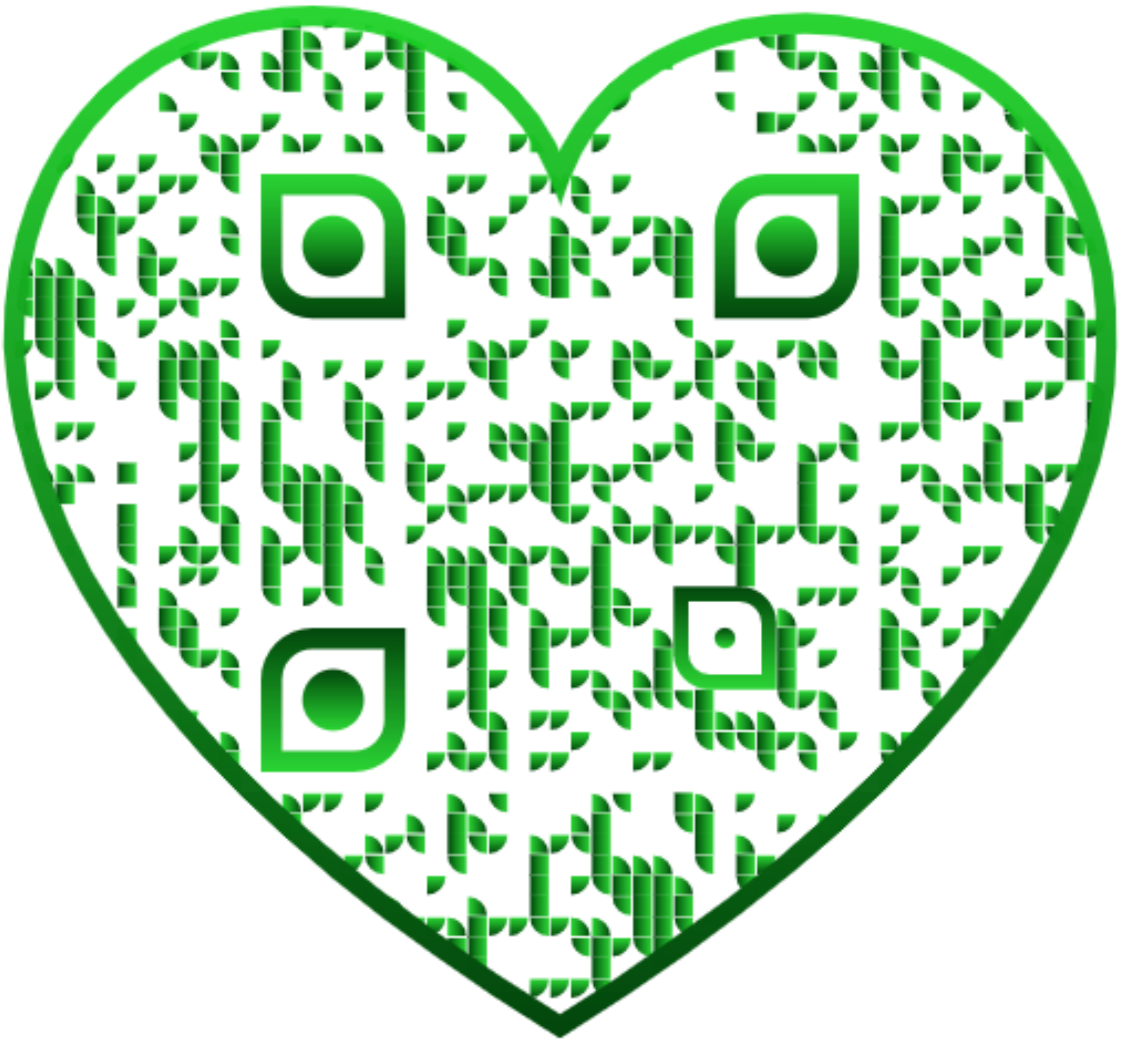
Energy, Cold Fusion, & Antigravity



See the future, know the past!

Frank Znidarsic PE



Energy, Cold Fusion, and Antigravity

By

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INTRODUCTION

Thank you for purchasing "Energy, Cold Fusion, and Antigravity". There are two schools of thought as to where we are heading. The first school of thought, as foreseen by climate scientist James Lovelock, predicts that we are rapidly heading towards a global catastrophe. The disaster will be triggered by the triple whammy of climate change, population increase, and the depletion of the fossil fuels. Lovelock's Gaia Hypothesis predicts that it is already too late. According to Lovelock, within this century, the only places on Earth that will be inhabitable will be at the poles. He advises, "*Enjoy life now while you can!*" Taking history as a guide, about 55 million years ago the Artic was a subtropical paradise and the tropics were too hot for most life. This period, the Paleocene-Eocene Thermal Maximum, arose after massive quantities of greenhouse gasses spewed out of volcanoes. The greenhouse gases emitted by the use of fossil fuels may be rapidly turning the earth's climate, once again, into a hothouse. The great intensity of some recent hurricanes may be a harbinger of the things that are to come.

The second school of thought, as foreseen by Peter Diamandis, predicts that we are heading into an age of abundance. This age will be ushered in by a rapid increase in the capabilities of computer and medical technologies. Fred Pearce in his book, "The Coming Population Crash", has revealed that societies that respect a woman's rights and provide for child care tend to maintain stable populations. Indeed the dire predictions presented by Paul Ehrlich, in his 1968 book, "The Population Bomb", did not come to pass.

Frank Znidarsic believes that the age of abundance can be acquired through the development of new, non-polluting, and abundant energy sources. The harnessing of the electromagnetic force has propelled us into this current age of wonder. New technology could classically harness all of the natural forces. These technologies will produce an abundance of clean energy. New propulsion technologies will efficiently propel spacecraft. These craft will provide resources from beyond the bounds of Earth. These technologies will propel us to the stars and lead us to the abundance of Peter Diamandis'

singularity. "Energy, Cold Fusion, and Antigravity" places these technologies in a historical context. It goes on to describe the science behind a technology that will control all of the natural forces. The development of these techniques will expedite the coming of the next technological revolution.

CHAPTER 1 Energy

The discovery of fire by ancient man, over 20,000 years ago, was a great achievement. Fire cooked his food and killed the parasites that afflicted him. He used fire, along with his new friend, the dog, to ward off predators. The carbon dioxide emitted by these fires may have led to a warmer and more habitual period. Bronze was first used to contain pressurized steam. In the 1st century AD, Hero of Alexandria invented the aeoliphile; a steam powered pinwheel. The aeoliphile demonstrated the potential of steam power; however, did not produce enough power to do any useful work. Higher pressure boilers came with the development of iron. In the 18th Century, James Watt invented his steam engine. In 1803, Robert Fulton demonstrated the first piston powered steam ship. Charles Parsons invented the modern steam turbine in 1884. Parson's turbine converted large quantities of high pressure steam into mechanical power. The British navy was presenting before Queen Victoria's in the 1897 Diamond Jubilee. Parson's ship, the Turbinia, blew past the Royal Navy at a speed of over 34 knots. The Turbinia easily evaded a picket ship that attempted to catch it.

In 1824, Nicolas Léonard Sadi Carnot published the first theoretical understanding of steam power in his work; "Reflections on the Motive Power of Fire". Maxwell Boltzmann, extended Carnot's work, and linked the power of steam to the motion of molecules. Boltzmann's analysis presented some of the first theoretical evidence for the existence of molecules. Unfortunately Boltzmann was ahead of his time and the established scientists did not accept his ideas. Boltzmann committed suicide out of sickness and frustration. Steam power, according to Carnot and Boltzmann, was much like water power. The water pressure between the inlet and outlet of a water turbine corresponds to the temperature difference between the source and sink of a thermal engine. The temperature difference sets a theoretical bound to the efficiency of all heat engines.

$$Efficiency = \frac{Temp\ in - Temp\ out}{Temp\ in}$$

The pressures and the temperatures of steam boilers were increased as steel replaced iron and as welding replaced rivets. The increase in efficiency reached a climax in the 1960's. Temperatures of over 1000 degrees Fahrenheit were reached. At this temperature boilers convert 9500 BTU's of heat into one kilowatt-hour of electricity. The thermal efficiency of these units is about 35%. Pressures of three thousand pounds per square inch are needed to confine the hot steam. At this pressure the weight of steam equals the weight of water. Water no longer boils. The non-boiling liquid carries dissolved solids and minerals onto the turbine. The life expectancy of alloy steel diminishes at these high temperatures. The temperature, of the latest generation of boilers, has been cut back a bit in order to reduce material costs and increase reliability. Steam power still generates the bulk of our electrical energy.

Coal

The combustion of wood and coal supplied the energy of the steam power. Coal still accounts for the bulk (about 50%) of U.S., electrical generation. My grandfather came through Ellis Island in 1916. The entry document says he was a coal miner. He came from a farm and knew nothing about mining. Coal was needed to power the industrial expansion of the time. I was told stories. The men were paid commission on the coal they loaded. If the boss did not like you; he would give you a job cleaning up rock. There was no pay for the loading of rock. My father followed, in my grandfather's footsteps, and advanced to the position of a mine fire boss. In his time, machinery was beginning to be used in the mines. The operation of large, high powered machines, within the tight quarters of low Pennsylvania coal, was dangerous. This high powered machinery stirred up quite a bit of dust. My father suffered with black lung when he retired. I was the first in the family to attend college. I graduated with degree in Electrical Engineering in 1975.

I was told to get a job with a big mining company. Perhaps I would work mostly on the surface. This I did, and the pay was good. I was in the mine for a first time in Windber PA in the late 1970's. The mine was low and the miners crawled to a place to have lunch. I am tall, the roof was low, and I could not sit up straight. I tried to drink coffee out of my thermos. The coffee ran down the side of my face. I spied a high spot about 10 feet away. I thought, "*Those lazy, non-educated coal miners will not even bother to move to a better location.*" I took it upon myself and moved to the decent high place for lunch. That's when one of them asked, "*Found a nice high spot son! Do you know why it is high?*" I responded, "*It must have been dug out for some reason or another*." He replied, "*That's where the rocks keep falling!*" I crawled back under the low spot with the rest of the miners. I quickly learned to respect the knowledge of the experienced workers. Mining was hard, dirty work. I knew then that it was not stuck, by my heritage, into in my blood.

While in the mines, I noticed a lot of water dripping down from above.

"*Where was it coming from?*" I asked, "*Probably from some farmers well or a small stream."* was the response. It was good clean water until it flowed into the mine and soaked up sulfur and other minerals. What happened to the crabs and lizards in the small stream? The mine's effluent would have to be treated for the next 10,000 years. Who was going to do that? In the future, they will surely hate us for leaving this mess!

Water collects in a basin, at the bottom of the mine, 300 feet underground. The first time I saw one of these basins, black water pouring in from all directions, I thought that I had discovered Dante's Inferno. The water was pumped up, by huge laboring pumps, from the basin to the surface. If these pumps could be run in reverse they would be mini hydro stations. My work, as an engineer, took me from the underground pumps up to the surface and into the water treatment plants. The process of cleaning up the bulk of the water was simple. The first step was oxidation. Air was blown through the water to oxidize it. The reaction converted the soluble green ferrous iron into a non-soluble red ferric iron. The pH was raised and the influent was seeded with alum. The ferric iron precipitated out (due to the common ion effect at the high pH) with the alum in the clarifier. The effluent of the clarifier still contained traces of many elements including mercury, boron, and selenium. The removal of these trace elements dramatically increased the cost of the water treating operation. Anaerobic bacterial digesters are required to remove selenium. The bacteria live in, what was called, the bug tank. Tighter requirements will require the use of activated carbon final filters. Who is going to keep this equipment running for hundreds of years? The plugging of abandoned mines, with lime slurry, was considered. It sounds like a good idea; however, I have never seen it done. It may not be possible to plug all of the fine cracks.

Modern strip mining replaces the coal's overburden and the top soil. Strip mining does not contaminate the streams to the extent that deep mining does. Acidic rocks lie just beneath the surface of the reclaimed land. These rocks tend to kill deep rooted trees. Locust trees, Japanese knotweed, and elder take up residence on the reclaimed land. The land does not appear to be of much use in farming. Coal mining leaves a legacy of bad water and bad land. Mining operations create a lot of jobs. These jobs create wealth at the expense of the environment.

I was hired, as an engineer in a large coal fired, power plant in the 1980s. I felt bad about leaving Chief Mining Engineer Ray Frank. He had spent four long years painstakingly teaching me so much. I was now working full time on the surface, however, I still dream about Ray telling me to do something or another. In the 1980's, power companies would often showcase their smoke stacks. "*Take a look!"* they would say, "*You can hardly see any soot coming out of the stack.*" They had a shaded opacity reference chart. The stack's low opacity, near the bottom of the chart, was a testament to the wonders of modern clean coal technology. I asked. ""*Why are the tree hugging extremists making such a fuss about the little bit of brown smoke that remains?*" One of my assignments was to automate an electrostatic participator's pneumatic top ash removal system. I did a fine job of it. It would automatically enter into a default mode if any single piece of equipment failed. The power plant would keep running abet at a reduced load. I was a true believer in the clean stack hypothesis.

Others, more informed than I, were not impressed by the singular performance of the electrostatic participator. It did not capture that little bit of brown smoke. Contained in that smoke were the noxious gasses.

Nitrous oxide is produced in the boiler as the nitrogen in the combustion air reacted with oxygen. This reaction proceeds within the high temperature of the boiler's flame. Smog forms as sunlight reacts with the released nitrous oxide. New regulations followed that required the reduction of these nitrous oxide emissions. In this effort, the temperature of the boiler's flame was reduced. The flame temperature was reduced by restricting the combustion air that was supplied to the flame. Boilers, up to that time, were designed to use an exact (stoke metric) fuel air mixture. The coal did not completely burn under the low oxygen, low NOx, condition. Some of pulverized coal carried over to the fly ash. The loss of ignition (LOI) reduced the boiler's efficiency and complicated the disposal of the, now flammable, fly ash. It was a balancing act to keep these low-NOx burners operating correctly. These burners, alone, could not meet the increasingly tighter regulations. Selective Catalytic Reducers (SCRs) were now required. They reduced the nitrous oxide in much the same fashion as does an automotive catalytic converter. These converters run hot, like the one in an automobile. Sections of boiler's economizer heat exchanger tubes were bypassed to keep the

temperature of the exit gas up. This reduced the boiler's efficiency by 15% or more. A plant superintendent summed it up best with his comment, "*A perfectly good boiler was ruined!"*

The coal comes with a few percent of sulfur (S). The sulfur reacts with oxygen, in the boiler, and forms sulfur dioxide. The sulfur dioxide (SO_2) reacts with the water vapor in the atmosphere and comes down as sulfuric acid rain (H_2SO_4). New laws required the removal of sulfur dioxide. A pretreatment of the coal was tried. The coal was crushed, microwaved and washed. This low cost technique was not effective. Sulfur dioxide had to be scrubbed out, after combustion, in a limestone solution. These limestone scrubbing systems are mammoth and expensive. They cost as much as 30% of the original plant and consume about 4% of the plant's electrical power. They have proven to be, in spite of these costs, economic. The company I worked in the 21st Century built excellent scrubbers of all types.

Carbon Dioxide (CO_2) is the main product of combustion. Like a blanket, it reflects thermal radiation back down to the Earth. This reflected energy heats the Earth. Carbon dioxide is the next gas to be removed from the exhaust stream. Plans are in the works to tax carbon dioxide emissions in 2015. Carbon dioxide constitutes 15% of the flue gas. That's a lot of gas. Its removal makes for a big material handling problem. Carbon dioxide dissolves in a liquid in the same way that it's does in a bottle of soda. It goes into solution in cool water and produces carbonic acid. The same process drives carbon dioxide into the sea. Excess carbon dioxide may turn the sea acidic and septic. Hydrogen sulfide gas is emitted from a septic condition. It's the gas that gives a sewer its smell. Hydrogen sulfide is poisonous. Some say that the hydrogen sulfide that was emitted, by a septic sea, killed the dinosaurs. God help us if that happens again! The flue gas is cooled to drive the carbon dioxide into solution. The carbon dioxide is then driven out of the solvent by the application of heat. The heating of the sea, by a global warming, will also drive heat trapping carbon dioxide out of solution. The increase in atmospheric carbon dioxide produces more heating. The result is a runaway increase in global warming. The cycling, of the temperature of the solvent, is an energy intensive process. The process of capturing carbon can consume 25% of the plant's electrical output. In conjunction with the other

emission controls over 30% of the plant's output can be consumed. For every three plants that are equipped with every clean technology another has to be built to supply the parasitic load of the environmental technology. More coal must be mined to supply this parasitic load. Clean coal technology has reached the point of diminishing returns on environment and capital. Newer and more efficient solid carbon dioxide sorbents are now being tested; however, no magic bullet is yet in sight. The capital costs of the carbon sequestering facility are huge. They can equal the cost of the original plant. The carbon dioxide must be sequestered underground at high pressure (5,000 PSI). A gas bubble, 25 miles in diameter, can form. Property owners have been reluctant to sell their mineral rights for gas disposal. Who is going to insure the unknown liability associated with this giant gas bubble? If power plants are lucky enough to lie near an oil field, the carbon dioxide can be pumped into an existing oil well. Carbon dioxide acts and solvent and helps to extract the residual oil. The use of the carbon dioxide, in this application, makes good sense.

Blow down from the scrubber, leachate from ash piles, and runoff from the coal piles require additional water treating facilities. Senior power plant engineer Dave Jacoby stated, "*All of this, just to spin the generator's shaft!*" Dave never saw the heroic efforts in the mine. Utilities are now backing away from investment in new coal fired power plants. It is not practical, in many cases, to meet the, December 2011, Mercury and Air Toxics Standers act. Many older coal fired power plants are now being shuttered. The United Mine Workers of America has estimated that 56,000 megawatts of coal fired capacity will be retired. In November of 2012 the Union of Concerned Scientists released its study. They found that as 353 generators in 31 states, totaling 59 gigawatts of generation capacity will likely be too expensive to operate after the installation of the additional pollution control equipment. These potential closures are in addition to 41 GW of already announced coal retirements. Coal was to have reigned supreme for the next 200 years. King coal appears to be headed for a hard time. The dream of an energy independent, coal fired economy has gone.

Oil

Oil is the most precious of the fossil fuels. It is packed with energy. It is a liquid at room temperature and it fuels the world's transportation system. Oil powered trucks transport coal to the power plants. Roads are built with the asphalt that was extracted from oil. Renewable energy sources, such as wind and solar, require the plastics that were made from oil. Crops are fertilized, harvested, and transported with oil powered equipment. In the 1960's, vast quantities of oil spewed out of the wells in Saudi Arabia. This sweet crude was priced at one dollar per barrel. An energy intensive, good life was to be had. The thing to do, in the 1960s, was to get a bigger engine and burn rubber.

M. King Hubbard presented a paper to the American Petroleum Institute in 1956. The paper correctly predicted that oil production, in the United States, would peak in the late-1960s. Hubbard went on to predict that global oil production would peek after the turn of the 20st Century. This peek has been delayed a bit by better extraction techniques. The world's oil supply is now peaking. The world's oil supply soon now enter into a state of steady decline. The world's greatest oil field, the Ghawar Field in Saudi Arabia, was placed on line in 1950's. Pressurized gas blew the oil out of subsurface cracks and up to the surface in a gusher. As these fields became depleted as the gas pressure was released. The released gas collected in a pocket above the oil. Many of the oil fields in Saudi Arabia now have useless gas caps. The oil no longer blows out of the crevices in the ground. New techniques, such as horizontal drilling and the flushing of the crude with water have extended the life of these oil fields. These techniques, if pushed too hard, can leave unrecoverable pockets of oil in the ground. The techniques tend to quickly deplete the remaining oil. Similar techniques have temporarily increased production in the U.S. A surprisingly large amount of oil is now being extracted in North Dakota.

Oil is extracted from the tar sands in the United States and Canada for a price of about $50 barrel. The extraction process strips the oil out of the sand with heat. The heat source adds carbon dioxide to the atmosphere. The mining

operations disturb massive amounts of ground. Many environmentalists are opposed to the extraction of oil from tar sands.

Gasoline engines require 20,000 BTUs of thermal energy to produce one kilowatt-hour of power. Their thermal efficiency is a dismal 17%. Government mandates have required more efficient gasoline powered engines. This increase in efficiency comes with an increased cost. The head of the Environmental Protection Agency, Lisa Jackson, resigned in 2012 as economic interests pushed back this environmental agenda.

Despite some temporary gains in efficiency and production, the end is coming. The world is slowly running out of oil.

Natural Gas

In the late 19th Century, coal gas was used in lamps. Carbon monoxide was produced by restricting the oxygen supply to burning coal. Carbon monoxide has an energy content of about 125 BTUs per cubic foot. Early town gas contained a lot of carbon monoxide. Carbon monoxide is extremely poisonous. Some old movies used the poisonous town gas in a homicidal plot. The hero saved the victim, a beautiful unsuspecting young lady, and became the love of her life.

The energy content, of coal gas, can be increased to about 300 BTUs per cubic foot by removing the nitrogen gas from the combustion air. Nitrogen constitutes 80% of the atmosphere. Nitrogen is practically inert and, as such, it does not react or dissolve. It could only be removed by, the energy intensive process, cryogenic distillation. The removal of nitrogen from the combustion air, to increase its BTU content, is an expensive proposition. The injection of steam into smoldering coal produces a chemical 'shift'. This reaction converts carbon monoxide into hydrogen and carbon dioxide. The carbon dioxide is then scrubbed out of the flue gas with a caustic solution. The remaining blue gas (blue burning without incandescent soot) has an energy content of about 600 BTUs per cubic foot.

Methane ($\mathbf{CH_4}$) has an energy content of over 1,100 BTUs per cubic foot. Natural gas is mostly methane and it is a good fuel. The discovery of new supplies of conventional natural gas peaked about 40 years ago. These conventional supplies are, as per Hubbard's has predicted; now depleting. In the early 1980s natural gas was in short supply. I worked in the steel industry in Birmingham Alabama. Processes were being studied that could produce 600 BTU gas from coal. This gas would be used to supply the existing heat treating ovens. An experimental plant produced gas, with an energy content of 1,100 BTUs per cubic foot, in Indiana PA. The faculty resolved many problems and proved the technology. The gasification plant could produce a high quality gas at a competitive price. The price of natural gas dropped in 1990 and the experimental gasification facility was shut down, and scraped.

Gasification technologies are now being resurrected. Coal gas would be

pretreated before combustion, in a power plant. The pretreatment would eliminate the expensive post combustion sulfur, mercury, and carbon dioxide separation systems. A marketable byproduct of the cryogenic distillation of air is argon gas. The costs of coal gasification, pre-treatment, and combustion are not proven. I expect that the costs associated with this technology, such as the distillation of the nitrogen out of the combustion air, will be high.

New supplies of natural gas have been, unexpectedly discovered in Marcellus Shale. The development of these supplies began in 2004. In 2011, 16,000 new gas wells were drilled in the U.S. This gas lies one mile beneath the surface. The drilling turns horizontality at a depth of one mile. It then proceeds horizontally for another mile.

The shale is fracked by driving millions of gallons of sand and chemicals (including the carcinogen benzene) into the wells. The fracking process cracks the shale and liberates the natural gas. The fracking water soaks up the usual suspects; sulfur, organic material, heavy metals, and salt. Once used, the fracking water has been transported to municipal sewage treatment facilities for disposal. These faculties employ bacteria to digest and remove organic material. These facilities can remove benzene in concentrations of up to 50 parts per million. They do nothing to remove the dissolved solids. These solids may, in fact, kill the bacteria and upset the sewage treatment plant. The only way to clean up the diverse waste streams, associated with fracking, is through a process of distillation or a process of reverse osmosis. Distillation is energy intensive. The membranes, used in reverse osmosis, tend to foul. More recently the franking water has been partially cleaned and reused in other wells. This solution has greatly reduced the amount of discharge.

The contamination of local supplies of ground water has been reported. Small earth quakes may have been initiated, by fracking, in the Midwest and in Ohio. The deep natural gas contains high quantities of radium. The federal government has now started cracking down upon the gas industry. New legislation intends to regulate the gas that escapes from the bore hole when the bit is removed, require a full disclosure of the fracking ingredients, and issue tough water discharge mandates.

Liquid carbon dioxide is now being introduced as a fracking fluid. The cryogenic fluid is quickly injected into the well. It warms and vaporizes as it contacts the subsurface strata. The gas greatly expands and efficiently fracks the shale. The carbon dioxide does not remain in the ground, it cannot contaminate the ground water, and it does not adsorb minerals. The injected carbon dioxide emerges with the natural gas at the well head and it must be removed before the natural gas can be put into a distribution pipeline. Carbon dioxide has conventionally been removed by dissolving it in a caustic solution. A molecular sieve has recently been constructed from a new type of plastic. This sieve efficiently absorbs carbon dioxide from the well effluent without the use of hazardous chemicals. There are, of course, the additional costs associated with the carbon dioxide, the separation facility, and the transport of the gas to the facility. It's going to interesting to watch the development of these situations over the next few years.

The benefit of the natural gas greatly exceeds its liabilities. Natural gas contains hydrogen. Hydrogen produces water vapor, not carbon dioxide, when burned. Water vapor forms clouds that decrease global warming. The latest generation of internally fired combustion gas turbines, with heat recovery, boilers consume only 7000 BTUs of thermal energy per kilowatt-hour of electrical energy. The thermal efficiency, of these units, is as high as 48%. Factoring in the parasitic loads associated with the latest generation of coal fired plants; a gas fired unit delivers twice the electrical energy per unit of thermal power. The increased efficiency reduces the emission of carbon dioxide by one half. "*Heat rate means a lot!*" Jim Conway, Senior Engineer.

As an additional benefit Ethylene can be extracted from the natural gas. Ethylene is used to make plastics. One of these plastics is acrylic. Acrylic is extremely durable. Acrylic is now being introduced as a paint additive. This paint retains its finish.

The storage facilities in the North East are currently filling with this new gas. At the time of this writing, the price of gas has dropped from $12 to $3 per 1,000 cubic feet. Given a BTU content of 1,000 BTUs per cubic feet, gas power costs about $3 per million BTUs. On a BTU basis (12,500 BTUs per lb.) the cost of natural gas equals that of coal at $75 per ton. The cost of deep natural gas has approached that of coal on a BTU basis. Plans to export the

gas will drive up its price. The price of natural gas is expected to stabilize at $5 per 1000 cubic feet. The cost of gas is expected to remain low enough to stymie investment in new coal fired generation. Utilities are turning away from coal and to natural gas. The estimate of the amount of extractable natural gas has been updated by a factor of three. Some geologists believe that even larger supplies of gas were trapped deeper within Earth during its formation. The primordial gas is of an inorganic origin. To date, none of this primordial gas has been discovered.

A limitation of natural gas is that it does not liquefy at ambient temperatures. It must be compressed when used for transport. Compressed gas is much less dense than a liquid fuel. The low energy density, of a compressed gas, limits its use as a transportation fuel.

As the earth's natural resources are depleted we have become better at extracting the remains. The president of Black Sheep Technology, Ronald Anderson, has stated that the window of opportunity, provided for by new natural gas, will close in 50 years. Ron should know, he reads several books a week. If new limitless sources of energy are not on line by then, there will not be enough energy left to facilitate a transition. If Ron is correct, it may be back to the Stone Age for all of us.

Renewable Energy

Water power is a prime renewable. It requires vast amounts of water and a high drop. The best sites, in the U.S., were developed decades ago. The building of the great dams, in the Western United States, was followed by a rapid population increase. The West has now become dependent upon this dammed up water. The onset of global warming may produce droughts that limit the flow of water into these dams. This may have already happened in 2012 and it's a bad sign.

In 2010 the giant Three Gorges Dam, in China, was filled. One and a half million people were displaced by the flooding. Valuable farm land was lost. The Yangtze River Dolphin was driven to extinction. More recently landslides, triggered by the new lake, have displaced an additional 100,000 people. This dam was built to supply 10% of China's electrical power. Due to the rapid growth of China's economy, the dam now supplies only 1% of its power. The dam did not, as intended, reduce China's carbon footprint. Hydroelectricity cannot supply enough energy to power world's rapidly developing economy.

Many windmills have been erected across the country. Wind mills only produce power when the wind velocity is greater than 9 MPH. If you see a wind mill spinning in calm weather; it could be motoring and using power. At more than 29 MPH they shut down to protect the generator. The production, of these windmills, had been supported by a tax credit of 2.3 cents per kilowatt. In late 2012 this tax credit expired. Layoffs ensued at the wind mill construction companies. It appears that wind energy cannot stand on its own merit. The same economics apply to active solar power.

In spite of massive effort to develop biofuels, ethanol plants are proving to be uneconomic. Some facilities are now being shuttered. I know of a few local farmers who have tried to make ethanol, for their own use, and have given it up. The ethanol tends to corrode fuel lines, eat gaskets, and pit aluminum. The production of ethanol was just not worth the trouble. The drought of 2012 drove home the fact that food production has been effected by climate change. In an effort to keep up production, ground water is being rapidly

depleted. The resultant worldwide increase in the cost of food was, in part, to blame for the recent unrest in the Middle East. Is the diversion of needed food into fuel feed stock ethical? There is still some hope that bio-engineered plants may enable bio-diesel to reach economic viability. Efforts are also underway to develop an efficient technology that can convert cellulose (stalks and grass) into fuel. Currently technologies require energy intensive high pressures, and temperatures, to break down the cellulose. There is an ongoing effort to find an enzyme or to engineer a bio-organism that will break down cellulose cheaply and efficiently. We hope; if a bio-organism is engineered that it does not get loose and eat all the rubber gaskets as it did in the movie, "The Andromeda Strain". These technologies, to date, are not close to economic viability. Fortunately, no rubber eating bacterium has been released.

Renewable energy sources require large quantities of land, material, and capital. These resources have better uses; like the production of food. Renewable energy cannot keep up with the world's insatiable demand for energy.

Cost effective energy storage systems would make it possible to utilize the existing energy supply more efficiently. In the late 19th Century compressed air, flywheels, and mechanical springs were tired in an effort to motorize street cars. The range of these street cars was measured in a few thousand feet. The compressed air tanks exploded, the fly wheels blew apart, and the springs released at once driving a street car to destruction.

In general, chemically stored energy is an order of magnitude more powerful than mechanically stored energy. Batteries store energy chemically. Since the turn of the 20th Century, attempts have been made to harness the possibilities of chemically stored energy. Thomas Edison introduced the nickel-iron battery at the turn of the 20th Century. It had a long life and could withstand many deep discharges. Unfortunately, it could not supply enough current to drive a traction motor. The nickel-iron battery tended to discharge itself over time. A modern nickel-iron battery stores about 40 watt hours of energy per kilogram of weight. The Exide Battery Company introduced the Exide lead acid battery in competition with Edison. It contained a little more energy than the Edison's battery on a per weight basis. It could deliver the

high currents that are required by large traction motors. Unfortunately, it did not hold up for long after it was deeply discharged. Did you ever try to use a computer U.P.S. supply as a portable power source? You cannot start the U.P.S. up after it has been unplugged. The manufacturer incorporated a lockout to prevent you from using it in this way. This type of use would deeply cycle the enclosed lead acid battery and ruin the battery. The lockout was added in an attempt to avoid warranty issues. Gasoline contains 13,000 watts hours of energy per kilogram of weight. It is no wonder that batteries fell out of favor after the introduction of the gasoline engine.

Pictured above is an electrically powered Fiero at Black Sheep Technology

It is having its electronic motor controller updated. The new controller contains Insulated Gate Bipolar Transistors. The transistors chop up the current and efficiently power the traction motor. The car has lead acid batteries in the trunk, under the hood, and in the back seat. With all of the batteries it weighs over 3,000 pounds. In spite of all of the batteries and the new controller, the car's range is limited to about 30 miles. The batteries are deep cycled and need to be replaced every year or so. General Motors recalled and scraped its lead acid electrically powered vehicle; the EV-1.

Lithium ion batteries are beginning to expand the possibilities of battery powered transport. These batteries deliver about 120 watts per kilogram of weight. That's still an order of magnitude, by weight, less than gasoline. The life of the lithium ion batteries is reduced by deep cycling; however, they can withstand deep cycling better than lead acid batteries. The heating and cooling load must be drawn electrically from the battery. Cold and hot temperatures reduce the battery capacity by as much as 60%. General Motors took a risk when they introduced the Chevy Volt. General Motors gambled that the battery technology would catch up.

I recently looked a motorizing my bicycle. A 50 cc 2 cycle gasoline conversion kit costs about $150. A 50 cc 4 cycle engine conversion kit costs about $350. The tanks on these retrofits store about a half a gallon of gasoline. These bicycles have a range of about 70 miles per full tank. A lithium ion battery conversion kit costs about $900. These bicycles have a range of about 15 miles. It takes time to charge the batteries and the expensive $500 batteries have to be replaced every few years. Given these economics, the production of the Chevy Volt has been suspended and A-123 Battery Systems has declared bankruptcy. Battery powered vehicles are getting better; however, they need to improve by a factor of ten to become competitive with gasoline powered vehicles.

"*It really begs the question as to whether the electric car at its current level of development is a suitable means of transport for the modern age.*" Dr. Barry Culpin, DeMontfort University

Renewable energy does not have the power to take us to the stars. It will not change the type of our civilization.

Nuclear Fission

The neutron was discovered by James Chadwick 1932. Ten years later, at the University of Chicago, the first nuclear chain reaction was initiated. Developments followed rapidly. In 1954, Lewis Strauss, Chairman of the Atomic Energy Commission, forecast that nuclear energy would be, "*too cheap to meter*."

Major problems surfaced quickly. At 9:01 pm January 3, 1961, the U.S. army's Stationary Low Power Reactor #1 (SL-1), near Idaho Falls, exploded. The Atomic Energy Commission reported, "The #2 crew member was struck on his back and legs with water and/or steam causing him to be thrown against a shield block and landing in the vicinity of the instrument wells. The #1 crew member was also struck with water and/or steam and was thrown back against another shield block striking his head first. Simultaneously, the shield plug assembly impaled the #3 crew member and pinned him to the floor of the fan room, a distance of approximately 13 feet above the reactor's head." The plug assembly had entered the groin of operator Richard Legg, exited through his shoulder and propelled him straight up to the ceiling. There he remained impaled on the ceiling. It took six days to extract his body. The intense radioactivity killed the bacteria and preserved his body. What remained of the three crewmen was buried in lead lined caskets. An unknown amount of radiation was released into the surrounding farmland. The incident ended the U.S. Army's nuclear program. Several things went wrong. The supervisor, Richard Legg, engaged in horseplay. The wife of another operator, John Byrnes, just called and asked for a divorce. No one knows how these events may have contributed to the accident. Design flaws allowed the reactor to quickly become supercritical.

New reactor designs were introduced. Bubbles in the boiling cooling water would reduce the neutron moderating effect of the water. This reduction would tend to shut down the reactor. The removal of a single control rod would no longer release a critical reaction. Admiral Hyman G, Rickover tightened up the Navy's operator training and selection requirements.

Rickover was tough; he did not allow casual conservation in the control room. Horseplay, for sure, would no longer be tolerated. The lessons learned from the accident would be enforced. No more accidents were to follow. One of my biggest problems, on the job, has also been dealing with juvenile people. People have flaws, even in a nuclear plant.

On October 5, 1966 Fermi#1 nuclear plant suffered a partial meltdown. No radioactive material was released. The plant is located halfway between Detroit Michigan and Toledo Ohio. John G. Fuller in his book "We Almost Lost Detroit" stated that the accident came close to becoming a major nuclear disaster. John F. Fuller defined this disaster as a release of half of the reactor's core material. He wrote that, sooner or later, a nuclear reactor would suffer this fate. The release of the half of the core material could contaminate an area the size of Ohio for 1,000 years. Lessons were learned from the Fermi accident. It was a fast breeder reactor that employed liquid sodium as a coolant. Sodium explodes violently upon contact with water. The design was inherently dangerous. It took four years to repair the Fermi Nuclear Station. Its performance remained poor and, in 1972, the reactor's core was dismantled and decommissioned. Breeder reactors were subsequently abandoned for all but experimental purposes. America's effort at operating a full-scale breeder reactor had failed. The United States was now dependent upon finite supplies of fissile uranium 235. The light water reactors, that used uranium enriched with U235, were deemed to be much safer than a breeder reactor. It was believed that John F. Fuller's disaster, involving a release of half of the core material, was nearly impossible with a U.S. designed light water reactor.

A boiler feed pump tripped at the Three Mile Island nuclear plant at 4AM on March 28,1979. The plant automatically shut down; however, a safety valve remained stuck open. The plant's operators misinterpreted the effect of the sticking safety valve and switched off the reactor's emergency cooling system. This action resulted in the melting of the reactor's core. A mass of hydrogen built up in the containment building. Some feared that the hydrogen would explode and John G. Fuller's disaster would occur. Pennsylvania could be uninhabitable for a Century. The containment building did not explode and the fail safe redundancy of the U.S. designed light water reactor was vindicated.

Foamed plastic, covered with two coats of a flame retardant paint was used as fire stop at the Browns Ferry Nuclear Power Plant. In March 22, 1975, one year after the Three Mile Island accident, a worker used a candle to search for air leaks. He accidentally set this material on fire. The fire spread from the foam to the reactor's control wiring. It caused a significant amount of damage. Once again the U.S. designed light water reactors were vulnerable in another way. The Nuclear Regulatory Commission reviewed the accident and implemented procedures that would prevent another such incident from reoccurring.

The Chernobyl nuclear plant, in the Ukraine, exploded and caught on fire. A large amount of the core material escaped. Entire towns became inhabitable. The Union of Concerned Scientists estimated that the number of additional cancer deaths from the released radiation will approach 25,000. In 2012, the president of Ukraine announced that an additional $1.58 billion will be spent on the sarcophagus that holds the remains of the dead reactor. Chernobyl's reactor employed non-enriched uranium and flammable carbon as the neutron moderator. It had no containment structure. It was believed that such a disaster could not happen with better designed light water reactors.

Fukushima

Fukushima is a U.S. designed light water reactor with containment. Unlike Three Mile Island, its containment structures did explode. An inspection of the reactor's core, with cameras, revealed that a significant amount of core material had escaped. Japan was very lucky that most of this radioactive material blew out to sea. John F. Fuller's disaster did occur, just as he said it enviably would. The Fukushima disaster effectively bankrupted, TEPCO, one of the largest power companies in the world. It will cost up to a trillion dollars and take 40 years to clean it up the mess. It is an ecological disaster of unknown proportions. A significant fraction of Japan's land area, 4,000 square miles, or 0.3% of all the land in the country, must be abandoned for up to 50 years. 90,000 people are displaced and homeless. They have lost their farms, businesses, schools, livestock, and all other possessions. All, but two, of Japan's nuclear power reactors were shut down. Eighteen percent of the Japan's electrical generation was shuttered. The nuclear power industry in Japan was destroyed. Japan's economy is suffering. The U.S. designed light water reactor was much more vulnerable than most experts believed possible.

Japan's former Ambassador to Switzerland, Mr. Mitsuhei Murata, spoke at the Public Hearing of the Budgetary Committee of the House of Councilors on March 22, 2012. Ambassador Murata stated that if the crippled Unit #4 reactor building collapses it will disrupt the common spent fuel pool. This pool contains 6,375 fuel rods. The radioactive rods are not enclosed by a containment structure. The consequence of the escape of this material into the environment would be horrific. The release of radioactive cesium, from the spent fuel pool, is exceptionally bad. Biological organisms tend to absorb and concentrate cesium and other radioactive elements. There is currently no long term solution to the disposal of radioactive waste. The Obama administration shut the planned Yucca Mountain disposal facility down. All nuclear plants store large quantities of radioactive material on site. This has been shown to be a dangerous arrangement.

New passive reactor designs are now entering the market. These reactors can shut down safely with the loss of all electrical power. It has been stated that a

release of core material is extremely improbable with this design. Many have lost their faith in this old promise. Will the next generation reactors be vulnerable; perhaps in another way? Professor Michio Kaku has suggested that nuclear reactors may be susceptible to the effects of a large solar storm. Germany and Japan are in the process of abandoning conventional nuclear power.

Nuclear Fusion

In 1934, Ida Noddack introduced the concept of atomic nuclear fission. In December 1938, Otto Hahn and Fritz Strassmann bombarded elements with neutrons in their Berlin laboratory. They found that some elements transmuted during the neutron bombardment. Uranium nuclei broke into two roughly equal pieces. The fracturing produced large quantities of energy. Within ten years of their discovery the first nuclear reactor Chicago Pile-1 was producing thermal energy. Controlled fission involves the fracturing of the Uranium 235. The earth contains a limited amount of uranium 235. Nuclear fission was first used to power atomic bombs. These bombs have a limit in their explosive yield of about 20 kilotons.

Nuclear fusion (the opposite of fission) bonds the light elements deuterium (heavy hydrogen) and tritium (doubly heavy hydrogen) into helium. The element deuterium is contained in sea water in a ratio of one part per 6,000. The supply of deuterium is virtually without limit. The rate, of fusion reaction, is set by a combination of temperature, time, and pressure. This combination is called the Lawson Criteria. Fusion progresses at extreme temperatures and pressures. Nuclear fusion heats the sun. The surface of the sun is not hot enough to initiate a fusion reaction. Fusion occurs in the sun's core at a temperature of about 15 million degrees K and at a material density of around 160 g/cc. Under these extreme conditions, fusion progresses slowly over periods of billions of years. A man-made thermonuclear power plant must consume its fuel more quickly. These machines must run at much hotter temperatures than that of interior of the sun. That’s a daunting prospect. The first fusion devices were, Soviet built, layer cake atomic bombs. A very hot atomic fission explosion initiated a secondary fusion reaction. The resulting fusion reaction produced many neutrons. These neutrons initiated more fission. These fission-fusion-fission bombs reached yields of about 500 kilotons. In the 1950’s Edward Teller & Stanislaw Ulam found a way to initiate a purely fusion explosion with an atomic explosion. A blanket of plastic was heated by a conventional fission explosion. The energy of the detonation blew off a plastic covering and compressed a core of lithium

deuteride. The core reached the extreme conditions required for nuclear fusion. These bombs reached yields of up to 50 megatons. A 50 megaton explosion will blow a hole about a half mile deep and mile wide.

In the 1950's it was believed that the tremendous power of nuclear fusion would soon be harnessed for the peaceful production of energy. Fusion reactions would burn a virtually limitless supply of heavy water (deuterium). Fusion reactors do not run away. They intrinsically shut down upon failure. Their waste products are shorter lived and cannot be used to build an atomic bomb. Fusion offered a panacea of power production. The most easily fused elements, deuterium and tritium, require a temperature of 40 million degrees to ignite. Temperatures of 100 million degrees are required for the commercial production of power. No sold material can contain the hot plasma. The first attempt to produce hot plasma, in the 1950s, employed a magnetic device called a Z pinch. A magnetic pinch compressed and heated the plasma. The temperature at the pinch proved to be many orders of magnitude too low. Magnetic bottles called Stellarators were tried next. It was discovered that a hot plasma is not easy to confine. Like a hot headed prisoner it become increasingly unstable and escaped from the best of the magnetic traps. The hot, unstable plasma quickly leaked from the Stellarators. The Stellarator process was not viable. The dream of nuclear fusion was now moved 30 years into the future. Hope came with the design of a better magnetic bottle; the Tokomak. It was invented in the 1950s by Soviet physicist Igor Tamm and Andrei Sakharov (the same men who invented the Soviet H-bomb). An international effort, involving 20 billion dollars, has constructed a massive Tokomak in Cadarache, France. The Tokomak has recently encountered design problems involving the stability of hot plasma. Plasma tends to release its energy in a burst of light. This effect is known as the Greenwald instability. It was named, after its discoverer, Martin Greenwald. It was named, after its discoverer, Martin Greenwald. Hope exists that ITER's problems can be solved. It is expected to produce small quality of energy in about 15 years. The days of cheap energy, at a cost of one dollar per barrel of oil, do not appear to be returning with the Tokomak.

Huge lasers at the National Ignition Facility in Stanford are being employed to trigger nuclear fusion. Small pellets, of about the size of the aspirin, are

heated to immense temperatures by these lasers. The pellets are compressed (imploded), by the heat, to a density of 100 times that of lead. Temperatures of 100 million degrees Kelvin have been reached. These temperatures and pressures have been maintained for a picosecond. The system almost meets Lawson's criteria. The powerful lasers, used in these tests, require hours to reset. To reach commercial viability, the process must run at a rate of 10 implosions per second. The director of the Laser Initialed Fusion Energy System (LIFE), Dr. Edward Moses, states that this goal can be accomplished within ten years. In 2012 The LIFE facility encountered unexpected problems and the fuel pellets failed to ignite. Four billion dollars has already been invested in this project. The resolution of these problems is, of course, dependent upon the spending of a massive amount of additional money.

After the expenditure of billions of dollars and 60 years of effort; it appears that commercial nuclear fusion will not be easy or cheap. The problems, of all conventional and proposed power sources, are best described by the line of the ABC's Rumpelstiltskin, "*All magic comes with a price!*"

Jed Rothwell has commented that the introduction of a new technology often follows major advances within an existing technology. The gas mantel, for example, was introduced at about the same time as the electric light. The hot rare earth mantel emitted a bright light when it was heated by a clean burning blue gas. It was heralded as the savior of the town gas system. In short order electric lighting dispatched the gas lamp; mantle too. A similar situation exists in the field of hot fusion. Just when it appears to be entering into practical application, it will be dispatched by economic cold fusion technology.

CHAPTER 2 The Genesis of Energy

There universe contains an enormous quantity of energy. This energy is not where it is needed and it does not come when it is wanted. Capturing solar energy with orbiting solar arrays is prohibitably expensive. Nikola Tesla stated that someday we would be able to "tap directly into nature's wheelworks". In order to tap into this wheelwork a new question needs to be asked. Where did the energy of the universe energy come from in the first place? An understanding of the genesis of energy may lead to the development of new terrestrial sources of energy.

The genesis of the universe has been a subject of study and speculation by the greatest minds in philosophy and science. The original ideas on genesis were produced by the Greek philosophers. It became apparent to the Greeks that all things came from other things. The Greek Empedocles (495-435 BC) announced that only fools (who have no far-reaching thoughts) would believe that something could come from nothing. The noted Greek philosopher Plato (427-347 BC) described the concept of a form. According to Plato the form was the property that made a thing what it was. Plato's student, Aristotle (384-322 BC), developed the idea of forms and concluded that each form was composed of a substance. The form of a substance could be changed but the substance itself remained eternal. Where did the original substance come from? The conclusion that the ancient Greeks drew was that a prime mover created the original substance. This prime mover was God.

In the Middle-Ages the greatest thinkers on the subject of creation were theologians. One of these theologians was St. Augustine (354-430 AD). It became apparent to St. Augustine, like it did to the Greeks, that all things came from other things. If the substance of the universe was not created, then this substance must have always been. If the substance of the universe was eternal, then time had no beginning. Every event is preceded by a prior event. Without a first event, everything that could have happened should have happened in the infinite past. For current time to have meaning, the chain of events leading to the events of today must have had a started at some

point. St. Augustine described this starting point as the first event. The first event was the genesis of the universe. St. Augustine used the Latin word ex-nihilo to describe the genesis. St. Augustine concluded that an infinite source or prime mover created the substance of the universe ex-nihilo. St. Augustine concluded, once again, that the source of stuff was God.

The Creation

Today scientists study the process of creation. Science does not address the question of who created the universe. Scientists have rules by which they work by called the conservation laws. Some of these conservation laws are the conservation of momentum, energy, and charge. Science asks the question; "How could the universe have formed within the framework of possibilities lying within by the conservation laws?" According to current theory and experimental evidence these conservation laws hold true, everywhere, and at all times. The scientific principle of the conservation of energy was established, in 1847, by Mayer and Von Helmholtz. It restates the old idea that something cannot come from nothing. According to the accepted theory of the big bang the universe sprang from nothing 13.5 billion years ago. How did this happen within the bounds of conservation laws? In 1973, the distinguished contemporary scientist Edward P. Tryon published his paper;

"Is the Universe a Vacuum Fluctuation?"

Tryon explained how the universe could have materialized without violating the principle of the conservation of energy. Tryon theorized that the total energy of the universe is zero. He stated that the positive energy of the universe's mass is balanced by a negative gravitational potential. It is well known that when something falls it loses gravitational potential energy. Take, for example, the energy produced by falling water at a hydro-electric power plant. The energy produced by the falling water is equal to the product of the weight of the falling water and the distance through which it falls. The relationship between energy, force, and distance is presented below.

$$Energy = Force \times Distance$$

According to Tryon, if a mass **M** were to fall to the edge of universe from an infinite distance away, the gravitational potential energy lost by the mass

would equal its mass energy. The mathematics used in this computation was applied on a grand scale; however, its formulation is the similar to the mathematics used in the simple water fall calculation. The universe was considered to be one large, round sphere. The force of gravity is not constant. It diminishes with the square of the distance from its source. Newton's invention of calculus is commonly used to compute the energy lost by a mass that is pulled by a force that varies with displacement. The left side of the next equation is Einstein's famous equation for mass energy. The right side of the equation gives the work produced as the variable gravitational force acts through a fixed distance. This exchange of energy was stated with calculus.

$$Mc^2 = GMM_u \int_{\infty}^{r_u} \frac{1}{r^2} dr$$

The limit of the calculation $\mathbf{r_u}$ states that matter's rest energy equals its gravitational potential at the edge of the universe. The equation contains one unknown the mass of the universe $\mathbf{M_u}$. A solution produced the mass of the universe.

$$M_u = 2\ x\ 10^{53}\ kg$$

This amount of mass will set the energy of the universe to zero. This is the quantity of mass required to conserve energy upon the genesis.

This result was compared to the mass of the universe as calculated from its density and volume. The universe has expanded beyond the visible radius. This portion, of the universe, is hidden behind a gravitational discontinuity and it does not interact with the visible universe. The visible universe was considered to be a sphere with a radius of 13.5 billion light years. It was assumed that it is filled with matter of the same density as our local space. This density is about four tenths of a proton of ordinary matter and eight protons of "dark" matter per cubic meter.

$$M_u = \left(\frac{.4\ protons}{m^3} + \frac{8\ protons}{m^3} \right) x\ Volume\ x\ M_p$$

The mass of the universe produced by the product of its density and volume was given below.

$$M_u = 1.7\ x\ 10^{53}\ kg$$

The vastly different constructs produced a similar result. Amazingly, these results agree to within 15%. This agreement demonstrates the validity of Edward Tryon's hypothesis. This argument reveals that the principle of the conservation of energy must be reinterpreted. It must now allow for perpetual motion. The negative gravitational potential of the newly formed energy cancels its positive energy. This has occurred at least once and it may be possible again.

In the nineteenth century, Ernst Mach (1838-1916) proposed that inertia is an effect of the influence of distant matter of the universe. For example, spinning matter experiences a centripetal force. Mach maintained that fixed local matter would also experience a centripetal force if the universe started spinning around it. The argument commonly used to dispel this idea is the same argument that was used to dispel the genesis process. It states that distant objects cannot influence local events. Essentially this argument asserts that no influence can travel faster than the speed of light. Given that distant regions of the universe are billions of light years away, these regions cannot energetically couple to a local event.

The arguments based on time and distances are not valid. For the sake of argument let's first assume that forces propagate instantaneously. The resulting forces are equal and opposite. The movement of local matter, in such a system, immediately affects the distant regions of the universe. No

additional forces, other than the original exchange forces, are required. These static fields would, conserve momentum through their own actions. In the real universe forces do not propagate instantaneously. It takes time for the gravitational field of matter to establish itself throughout space. Moving matter immediately experiences the force of the established gravitational field of distant matter. The fields of the moving matter require a finite amount of time to propagate outward. For a period of time, distant matter will continue to be attracted to the moved matter's old position. During this period, the original static forces are not capable of conserving the system's momentum. Additional forces are required. Michael Faraday discovered that a moving electrical charge induces a magnetic field. The magnitude of the magnetic field produced by the dynamic movement of an electrical charge is proportional to the charge's speed. When a moving electron passes through a changing electrical field, a second magnetic field is produced. The magnitude of this second field is proportional to the rate of change of the external electrical field. A local force is produced by the interaction of these two magnetic fields. The action of this local electro-magnetic force balances the momentum of moving electrical charges.

Einstein's equations demonstrate that moving matter induces a gravitomagnetic field. The gravitomagnetic field has a structure similar to the electric-magnetic field; however, it is of a gravitational origin. The gravitomagnetic field affects mass not electrical charges. The gravitomagnetic field carries the inertia of a moving matter. In a system consisting of moving force fields, momentum is conserved through the induction of transient magnetic forces (magnetic, gravitomagnetic, and strong nuclear magnetic). Faraday expected that a static magnetic field would impose a continuous electrical potential. He discovered that only varying magnetic fields induced an electrical potential. Faraday did not know why the process of electromagnetic induction was coupled with time. The element of time must be coupled with the process of induction in order to conserve momentum within a universe in which disturbances, in static force fields, propagate at finite velocities. Gravitational linkages couple local events to remote regions of the universe. This coupling is accomplished through the introduction of dynamic gravitomagnetic forces. These magnetic forces act as a reservoir of momentum and energy. This reservoir stores energy and

momentum until it can be transferred to distant regions of the universe. Local positive energy is linked to the negative gravitational potential of the universe through the interplay of transient gravitomagnetic interactions. In time, the books balance and the magnetic reservoir is depleted. Energy will be, once again, conserved through the action of the original static force field.

The force fields conserve momentum through a process of induction. The behavior is exhibited by all of the natural forces. The action is a fundamental property of our universe.

The Genesis Process

Scientific arguments have shown that it is energetically possible to create substance from nothing. These arguments have tremendous philosophical implications. Can man now create something out of nothing? If he does he will acquire a power that was, since antiquity, considered to be exclusively within the domain of the Gods.

Inventors have been trying to build perpetual motion machines for centuries. The latest generation of inventors has been trying to extract zero point energy through a process of Casimir collapse. None of these inventions has worked and the patent office currently rejects all applications for patents on such machines.

"*Joe Newman made one contribution to society in his lifetime, by suing the Patent Office for denying him a patent. The 1986 decision in Newman v. Quigg (the Patent Commissioner) is now cited as the authority for denying patent applications for perpetual motion machines out of hand."* Dr. Robert Park

If something can be created out of nothing without violating the principle of the conservation of energy; what then inhibits the process of genesis? Does the process require exotic conditions like those that prevailed during the birth of the universe? Can genesis occur today and under ordinary conditions? "What kind of a machine could make something from nothing? *"The best way to predict the future is to create it yourself!"* Peter Diamandis'.

It has been known, since the time of Boltzmann, that energy flows from a concentrated low entropy state to a dispersed high entropy state. The heat in a cup of coffee, for example, tends to disperse throughout a room. The heat of a room, however, does not tend to concentrate within a cup of hot coffee. The direction of this dispersion is mathematically quantified in units of entropy. The entropy of the highly concentrated energy, at the moment of creation, must have been low. Sean Carroll has written,

"*Why did the universe have low entropy near the Big Bang? It's not hard to understand why entropy increases; what's hard to understand is why it was*

ever low to begin with."[31]

Carroll's question can be restated. Is low entropy an essential ingredient of the genesis process? Can the low entropy condition of the original energy provide a clue to its origin? These questions suggest that a genesis machine may require the assistance of a low entropy superconductive Bose condensate.

The entropy of the original energy may have been zero. Energy, at zero entropy, is concentrated within a single body. The single bodied, low entropy, early universe spun without reference. The principle of the conservation of angular momentum had no meaning at this moment. Is the dismissal of the conservation of angular momentum an essential ingredient of the genesis process? A genesis machine must also produce new energy without regard to angular momentum. This action can be accomplished by producing two particles of energy; each with an opposite spin. The coupling of spins, with the materialization of energy, lies at the root of Einstein's spooky action at a distance.

The contemporary universe has expanded beyond its visible extent. The positive energy of the existing stuff no longer couples to the negative gravitational potential of the matter beyond the visible horizon. This decoupling may have frozen the universe into the state we now enjoy. A new universe will have to be constructed, in the lab, containing particles with masses that can couple with the current value of negative gravitational potential. The phonons (vibrations) in a Bose condensate are elementary and can carry variable amounts of energy. These macroscopic vibrations exist within the universe of a Bose condensate. A condensate of protons may exist within domains within a proton conductor. The process of cold fusion progresses through the vibration of these protons. Can genesis occur within the superconductive regions of a proton conductor? Physicist Steven Jones argued that the process that is being called cold fusion is probably not nuclear. What is the magic that is producing the excess heat? Can energy materialize from nothing? What price will we pay if we tap it?

The hydroelectric, pictured above, converts the gravitational potential of dropping water into electrical energy. A genesis machine would harness the gravitational potential of a dropping universe.

The Heisenberg Uncertainty Principle has shown that vacuum fluctuations do generate anomalous spikes of energy. Many events, in the quantum realm, originate as a condition of these temporary bursts of energy. These bursts of energy cannot be vectored and quickly return to the vacuum. They cannot be employed to perform any useful work. The attempt, to harness this zero point energy, has failed. This author strictly adheres to the principle of the conservation of energy. He suggests that these bursts of positive energy are accompanied by the negative potential of a strong, local gravitomagnetic field. This emergent strong gravitomagnetic field can be employed. The analysis of the path of the quantum transition, later in this text, reveals that the quantum transition requires a burst of anomalous kinetic energy. This kinetic energy cannot be tapped; however, the strong local gravitomagnetic field that accompanies it can be harnessed with technology. This utilization will allow for a classical exploitation of all of the natural forces. Open, fresh minds must begin exploring this possibility.

CHAPTER 3 Electromagnetic Induction

In ancient times (221 B.C.) a rock, called lodestone, was floated in a dish of water. The lodestone formed a natural compass. The magnetic influence, upon the stone, was mysterious. The magnetism reached through space unseen, touched the stone, and turned the compass. The magnetic influence was invisible, permeated all of space, and exerted a force on all of nature. In 1600, William Gilbert likened this action to hand of God. In the 1700's, Benjamin Franklin rubbed glass and amber rods with fur and cloth. A charge of static electricity built up upon the rods. When the rod was placed near a grounded object a spark of electricity leaped from the rod. The electrical force exerted other mysterious influence; it attracted and repelled dust particles, hair, and fine particles. The ancient Hindu scriptures describe the Brahman. It's the basis of the material world, a God like force that holds all things together, and the hidden power that is latent in all things. The existence of the Brahman could only be recognized by special people with a keen insight. The invisible magnetic and electrical forces reach through space and bond matter as would the Brahman.

In the 1820s, Hans Christian Orsted built a crude liquid battery in a glass jar and ran the current through a wire. He demonstrated the experiment before his class. He sat, by chance, a compass near the wire. The compass deflected as the current flowed through the wire. Orsted discovered that a flowing electrical current induced a magnetic field. Orsted showed that the mysterious forces of electricity and magnetism were intimately interconnected. Professor Walter Lewin of M.I.T. has stated,

"*Orsted's discovery was momentous". It rates right up there with the discovery of fire, gunpowder, and the wheel.*"

This discovery was employed in the building of generators, motors, transformers, ignition coils, and speakers. The process of electromagnetic induction forms the foundation of a large part of our modern technology. It is fundamental to the electrification of our civilization.

The action revealed the beautiful symmetry through which the natural forces

act. A face is seen as beautiful, for example, when the left and right sides of the face are symmetric. The electric and magnetic fields exhibit a beautiful symmetry in that a flowing electrical current induces a magnetic field and, symmetrically, a changing magnetic field induces an electrical current. In 1861, James Clerk Maxwell, one of the greatest geniuses all time, quantified this symmetrical relationship within his equations. The formulations of James Clerk Maxwell were fundamental, symmetric, and beautiful. They revealed that the action of creation was symmetrical. With this understanding; Maxwell appeared to have read the mind of God. This reading did not reveal a God who acted upon the concepts of good and evil. This God did not speak in any natural human language. Maxwell discovered that the actions of the creator revolved around a beautiful symmetry. These actions were precisely spoken in the unnatural language of mathematics. Maxell's equation was presented next.

$$\oint E \cdot ds = -\frac{d}{dt}\int B \cdot da$$

Both sides of Maxwell's equation are mathematical formulations called integrals. This left side describes the electrical voltage ***E*** around a closed loop of wire. The right side describes the rate of change of the magnetic field ***B*** through that loop. In English the equation states that the voltage around a closed loop of wire is proportional to the rate of change of the magnetic flux through that loop; and vice versa. This equation precisely described the process of electromagnetic induction. This process was built into the technology that currently immerses us. The electric and the magnetic forces bind the substance of the universe. They act like the mortar of a brick wall. Their action, as Gilbert has suggested, is like that of the hand of God.

An electrical current also carries an impetus. This impetus opposes a change in an electrical current. An automotive spark coil employs electrical impetus to its advantage. The ignition system quickly interrupts the current through a

coil. The impetus of the electrical current, within the spark coil, presses forward through a high voltage arc. James Clerk Maxell showed that the impetus of an electrical flow produces a voltage in opposition to a change (the delta) in current.

$$Voltage = Inductance \times \Delta Current$$

Similarly, Isaac Newton showed that the matter produces a force in opposition to a change in its velocity.

$$Force = Mass \times \Delta Velocity$$

These two equations have the same form. This form shows that electrical voltage is analogous to mechanical force and that electrical inductance is analogous to inertial mass. The essence of inertial mass is unknown; however, the constituents of an electrical inductor are well known. A ferromagnetic core can be placed within an electrical solenoid. The soft iron in the core soaks up the magnetic flux like a sponge. Electrons orbit the nucleus in ferromagnetic iron. These electrons form tiny current loops. A small magnetic field is produced by the residual of this spinning motion. The magnetic fields, of billions of atoms, line up in unison within a grain of ferromagnetic material. The magnetic fields of the grains, however, are randomly oriented. The magnetic field of the grains can be lined up through the application of an external magnetic field. That's how a permanent magnet is made. Magnetism is not a conserved property and the insertion of ferromagnetic core into an energized solenoid can increase its magnetic field by a factor of 10,000 or more. The additional magnetic flux emerges from nothing, ex-nihilo. The additional magnetic flux increases the inductance of an electrical solenoid. Given that electrical inductance is analogous to inertial mass there should be conditions that increase inertial mass. Special Relativity has revealed that the addition of velocity is one such condition.

Vibration destroys the composite magnetic field of a ferromagnetic material. If an electrical pick up coil placed near a permanent magnet as the magnet's atoms are vibrated with the application of heat, it will detect the

randomization of the orientation of the grains. If the output of this coil is fed through an audio amplifier clicking sounds can be heard. The clicks are much like those of a Geiger counter. The coherer is an early radio receiver (circa 1910) that employed this phenomenon. It produces a clicking sound as the magnetic field of a ferromagnetic metal powder was destroyed by radio frequency vibration. Magnetic amplifiers also work through a process that effectively destroys the inductance of a ferromagnetic core. These composite magnetic fields do not go somewhere else. They are not conserved and just go away. Given that electrical inductance is analogous to inertial mass, are there conditions where vibration destroys inertial mass?

I recall being in Professor Richard Bender's class at The University of Pittsburgh at Johnstown in 1973. Professor Bender was going over the air core transformer. The simplest embodiment of an air core transformer is two inductors connected in series. Professor Bender stated that the inductance of the combination was equal to the self-inductance of the first inductor plus the self-inductance of the second inductor. This made good sense to me as the physical construction and the current within the inductors did not change. Then he added on an additional exponential term that accounted for the mutual inductance of the two interacting inductors. I thought,

"*Where did that come from? Why does everything have to be so hard*?
Surely, I am going to flunk!"

I realized, much later in life, that magnetism is not a conserved property of the universe and that the mutual flux emerged from nothing, ex-nihilo. Professor Bender moved on in his lecture and never revealed this. I remained stuck right there. The renowned professor Walter Lewin of MIT has stated that magnetism is non-conservative but I have never heard him specifically state that magnetism is not a conserved property of the universe. So I will say it. The system that that magnetism emerges from must obey the conservation laws; however, the non-conserved properties of magnetism, and by analogy inertial mass, are beyond mathematics. Magnetic fields can appear and disappear at will. The may be responsible for Einstein's spooky interaction at a distance. They can be stretched to galactic distances.

Entanglement may dependent upon this action. Later in this text it will be shown that the quantum condition emerges from classical Newtonian mechanics as a consequence of the non-conservation of magnetism and inertial mass. This non-conservation has gone largely unnoticed and this text will go on show that it is of the most importance.

The static electrical field is conserved. Dielectrics can only decrease the strength of the static electric field. A superimposed field of the opposite polarity, within a dielectric, reduces the strength of the composite static field. No material or condition can increase the strength of any static field. I know of only two things that are not conserved; magnetism and internal mass. A strong composite magnetic field is produced within paramagnetic materials. Soft iron is used, within electrical equipment, to greatly amplify the strength of the electro-magnetic field. This strong magnetic field is employed, through a process of induction, to power our economy.

Gravitational Induction

The dynamic electro-magnetic field is not conserved. The magnetic field emerges, as needed, to conserve the momentum within a system of moving static force fields. No disturbance can propagate faster than light speed and all of the natural forces conserve momentum through the process of induction. The induced component of the gravitomagnetic field, as expressed by General Relativity, was presented next.

$$B_g = \frac{K_g G}{c^2} \frac{dm}{dt}$$

General Relativity revealed that moving mass (**dm/dt**) induces a gravitomagnetic field in the same way that a flowing current (**dq/dt**) induces a magnetic field. The gravitomagnetic field has the same structure as the electro-magnetic field; however, it is not of electromagnetic origin. The gravitomagnetic field carries the momentum of moving matter. The induced gravitomagnetic field is vanishingly weak. This weakness is expressed by low permeability of free space to the gravitomagnetic field, **G** divided by **c** squared. The gravitomagnetic field is ten to the thirty ninth power weaker than the electro-magnetic field. The gravitomagnetic field, produced by the rotation of the entire earth, is so weak that it was barely detected by the most sensitive orbiting gyroscopes.

The relative permeability expresses the amplification of the magnetic field within a paramagnetic material. The relative permeability of the gravitational field $\mathbf{K_g}$ is always considered to be one. It was never factored into the equation. The strength of the gravitational field is considered to be fixed and ten to the thirty ninth power weaker that the electromagnetic field. The Earth's gravitational field is easily overpowered with a tiny magnet. It takes the whole of the earth to produce the gravitational field that we experience. The Earth's mass cannot be spun within a machine in order to harness

gravitomagnetic induction. This author suggests that strength of the gravitomagnetic field, as with all of the dynamic magnetic fields, is not a conserved property of the universe. Murray Gellman has stated, "*Anything that is not forbidden (by the conservation laws) is mandatory*". Soft iron dramatically increases the strength of the electro-magnetic field. There must be a material or a condition that affects the strength of an induced gravitomagnetic field. This material would have a large permeability $\mathbf{K_g}$ with respect to the gravitational field. The lining up of electronic spins within ferromagnetic material provides a clue as where to look for a para-gravitomagnetic material. A para-gravitomagnetic material would strengthen the gravitomagnetic field. Could the alignment of the nuclear spins amplify the gravitomagnetic field and produce a para-gravitomagnetic effect? Nucleuses line up in the presence of a strong magnetic field. An MRI imaging machine, for example, works through a process that depends upon an alignment of the nuclear spins. No gravitational anomalies have been reported emanating from MRIs. In 1995, Scientist Dr. Ning Li suggested that nuclei that are both aligned and spin up may induce a significant para-gravitomagnetic effect. She was not able to demonstrate such a technology.

In 2013, Valery Milner, a molecular physicist at the University of British Columbia kicked molecules of a gas with a powerful 100-trillionths-of-a-second laser pulse. The molecules were spun up to 10 trillion rotations per second. Milner stated,

"*There's definitely nothing macroscopic that can spin that fast. A car with tires turning at that spin rate would travel the distance to the nearest star in half an hour.*"

Is it possible to induce a strong gravitomagnetic field with this technology?

Superconductors are a new state of matter. This state profoundly affects the electro-magnetic field. Superconductors are dia-magnetic and completely impermeable to a magnetic field ($\mathbf{u_o=0}$). The magnetic field inside the superconductor is zero. Magnetic flux is driven out beyond the surface of a superconductor. This action is known as the Meissner effect. It is the opposite of a flux increasing paramagnetic effect. The effect binds the magnetic dipoles of trillions of atoms into a new state of matter. A strong composite magnetic field rests upon the surface of a superconductor. Maglev

trains are lifted by this strong magnetic effect.

The static gravitational field has no field of the opposite polarity. It cannot be reduced by shielding Dia-gravitomagnetic materials are not; however, beyond the realm of possibility. These dia-gravitomagnetic materials would expel the gravitomagnetic field of trillions of spinning nucleons to the surface of the material. In his quest to find such a material Frank Znidarsic traveled, in 1992, to the Institute of Advance Study in Austin. He spoke there with Dr. Hal Puthoff. At that time Puthoff was working with a concept called a Goldstone Boson. This Boson purportedly had strong gravitomagnetic effect. No strong gravitomagnetic effect was detected emanating from any superconductor. Superconductors were frozen up, at rest, an appeared to do nothing. What are the special ingredients needed to manufacture a dia-gravitomagnetic material?

Pictured above is Frank Znidarsic and Hal Puthoff in 1992

In 1998 Frank Znidarsic visited the Marshall Space Flight Center in Huntsville Alabama. They were conducting gravitational experiments based on the work of Yogini Podkletnov. Podkletnov vibrated a spinning superconductive disk with radio waves. A strong gravitational anomaly was observed when the magnetic field was operating at high frequencies, on the order of 3.2 to 3.8 MHz. Do vibrations expel the gravitomagnetic field of a rotating superconductor? Does the action send the superconductor into a state of macroscopic quantum transition?

Pictured above is NASA scientist Glen Robertson in 1997

NASA made superconductive disks and spun them. Robertson is holding a magnetic disk used in NASA's experiments. NASA's budget was cut, by short sighted individuals, and they never completed the experiments with an applied radio frequency field. In 2011, Glen Robertson and Frank Znidarsic went on to publish a peer reviewed scientific paper "The Flow of Energy" in "Physics Procedia".

In a parallel effort BAE systems attempted to replicate Podkletnov's results in the UK. They assumed that the only purpose of the radio frequency stimulation was to rotate the disk.

Ronald Evans an engineer with BAE system's project Green Glow writes.

"*Limited funding meant that Podkletnov 's method of using Meissner levitation and interaction with a radio frequency field to generate the rotation of the YBCO disc was not attempted… However, this still leaves the possibility that it was Podkletnov's method of electromagnetic excitation of*

his superconducting annular disc that gave rise to a gravitational effect."

Podkletnov applied a three megahertz radio wave to a 1/3 of a meter disk. The product of the frequency and diameter equals one million meters per second. Indeed Charles P. Poole, of the University of South Carolina, wrote that one million meters per second was the speed of light within a superconductor.[33] Znidarsic suspected that this speed was fundamental to the induction of a strong gravitomagnetic field but, at the time, he had no clue as to how or why. Could the process of vibration profoundly influence the relative gravitational permeability $\mathbf{K_g}$ of a superconductor? Is it possible to induce a strong (ten to the thirty-ninth power stronger) gravitomagnetic field? Why was the velocity of one million meters per second special?

Empirical Cold Fusion

In a parallel development Martin Fleishmann and Stanley Pons claimed to have discovered that fusion progresses within a proton conductor. Pons and Fleishmann were renowned scientists. There announcement in 1989 produced a firestorm of activity. Dr. Robert Park (spokesperson for the American Physical Society) John R. Huizenga (a renowned nuclear scientist at the University of Illinois), and Dr. Richard Garwin (a renowned nuclear bomb scientist) jumped into the fray. They 'knew' from well-established theories that room temperature fusion was not possible. Fusion requires a minimum temperature of 40 million degrees K. The lack of radiation and emitted neutrons completely ruled out the possibility of any type of nuclear reaction. The cold fusion process proved to be fickle and was not reproducible. The scientific establishment turned its back on cold fusion. The magazine Scientific American refused to publish articles on cold fusion. The patent office automatically denied all patents based upon cold fusion. This story is one of the greatest fiascoes since the clergy refused to look through Galileo's telescope. A small cadre of independent inventors continued to generate heat within their cold fusion cells. In 1990, Dr. Robert M. Bass published a paper, "Stimulation / Actuation, and Automatic Feedback Control of Cold Fusion". This paper suggested that thermal vibrations expedited the cold fusion process. Were the thermal vibrations in a cold fusion cell related to the radio frequency vibrations within Podkletnov's device?

Pictured above is Frank Znidarsic and James Patterson in December of 1995

James Patterson was one of the first to produce large amounts of heat. Znidarsic traveled to Anaheim California took a peek at Patterson's cell. By chance Dr. George Miley, a great contemporary scientist, also attended the gathering. Patterson used a preheater to get the reaction started. How can low energy thermal vibrations influence a high energy nuclear reaction? It was also becoming apparent that cold fusion progressed within a nanometer domain. Jed Rothwell wrote in "Infinite Energy, Issue 29, 1999, page 23", "*50 nanometers ...is the magic domain that produces a detectable cold fusion reaction*". Electrical conductors convey electrons and proton conductors convey protons. Hydrogen nucleons flow through a proton conductor in reaction to an applied voltage. Palladium deuteride and nickel hydride are proton conductors. In 1971, Cameron Satterthwaite, professor emeritus of physics, was the first to discover superconductivity in palladium deuteride. Many others have since confirmed this discovery. This superconductivity

exists, within nano-domains, at room temperature. Can nucleons, dissolved within a proton conductor, bind into a single collective state? A collective state of protons is known as an inverse Bose Einstein condensate.

It took a while to put it together but Znidarsic finally figured it out. The speed of a traveling wave is normally expressed in units of meters per second. The speed of a standing wave is zero. The vibration of a standing wave can be expressed as the product of its frequency (in cycles per second) and its wavelength (in meters). Units in hertz-meters are equivalent to the units of meters per second. The apparent speed of standing wave can be expressed in hertz-meters. The product of the thermal frequency (20 terahertz) and the palladium grain size (about 50 nanometers) equaled an apparent speed of one million hertz-meters. Znidarsic had previously observed this speed within Podkletnov's superconductive disk. The radio waves and the thermal vibrations gave a superconductor a kick and sent it into motion. The vibration of a superconductor or a proton conductor, at a dimensional frequency of one million hertz-meters, reinforced the condensate, and formed a new state of matter[41]. . This state is that of a continuous quantum transition. Gravitomagnetic flux was diamagnetically expelled from the transitional state. Was an expelled gravitomagnetic field producing power through a process of genesis?

Dr. George. M. Miley completed an analysis, of Patterson's cell, at the University of Illinois. In 1997, Miley presented this result at the Wright Patterson air force base. Znidarsic attended the meeting. Miley plotted the products of the reaction on a periodic chart. The result was **U** shaped curve. The fracture of a heavy element produces a distribution of daughter elements. These daughter elements lie on a **U** shaped curve. The original heavy element rests at the bottom of the **U**. Miley interpreted the distribution of daughter elements to be the result of the fission of a large collective nucleus. This collective nucleus had an atomic mass of 154. It was almost twice as heavy as Uranium! It appeared that a collective nucleus magically emerged within the reaction. The process of cold fusion was subsequently renamed and it is now known as a low energy nuclear reaction.

The interior of the sun is just hot enough to slowly fuse the heavier elements. The transmutation of elements heavier than iron, by existing theory, requires

the tepid energies of a supernova explosion. Existing theory does not allow for the emergence of a multi-bodied collective nucleus under any circumstance. Miley's results were widely criticized. When Miley claimed that the heavy elements had transmuted at room temperature, some asked if Miley had gone mad. It was said that Miley had fooled himself and that his experiment was contaminated. Miley countered that he had detected elements with abnormal isotropic ratios (different numbers of neutrons). These ratios did not exist in nature and could only be the result of a nuclear reaction. Paterson subsequently encountered trouble with the reproduction of his results. The lack of reproducibility, once again, provided more ammunition for the antagonists. Slowly and surely other independent scientists also began to produce results. It appeared that the diamagnetic effect extended to the magnetic component of the strong nuclear force. This magnetic component of the strong nuclear force is known as the spin orbit force. The spin orbit force accounts for the stability of the even numbered elements. Did a universal diamagnetic effect expel the spin orbit force to the surface of a nano-particle? As demonstrated by the electromagnetic example, such an effect lies within the bounds of the conservation laws. It is possible. The expelled nuclear spin orbit force would act upon a cluster of nucleons from the surface of the nano-particle. At the invitation of Dr. George Miley, in 2000, Znidarsic first presented his theorem at a meeting of the American Nuclear Society.

U.S._Department of_Energy

This theorem states,

"*The constants of the motion tend toward the electromagnetic in a Bose condensate that is vibrated at a dimensional frequency of 1.094 million hertz-meters*".

This theorem states, in a scientific way, that the vibration of a proton conductor or a superconductor adjoins electrons and protons into a single collective state. The magnetic components of the force fields (electromagnetic, gravitomagnetic, and nuclear spin orbit magnetic) are

expelled to the surface of a nano-crystal. Dr. Miley continued to make his crystals as large as possible. Miley quickly follow suit, and is now using nanometer sized crystals. The verdict is out. Many good scientists, such as Dr. Edward Storms, believe that the nano-grain size only facilitates the absorption of hydrogen gas. . An admixture of lithium, in the form of lithium aluminum hydride, appears to facilitate the formation of the nano-meter sized grains.

The competing poly-neutron theory of Larson and Widom has recently gained some acceptance. This theory cannot explain the lack of emitted radiation. Nucleons overcome their mutual electrostatic repulsion by flying over the electrostatic potential barrier. The process is like driving over a speed bump. A thump is emitted as you hit the bump. A gamma ray and a neutrino are emitted, as a thump, as an electron flies over the electrostatic potential barrier of the nucleus. The high energy process of electron capture, that produces Larson & Widom's slow moving poly-neutrons, must emit high energy radiation.

A way to negate the effect of a speed bump is to step over it. Dr. George Mathos, of the University of Indiana, has stated that the only way in which a nuclear reaction can proceed without emitting high energy radiation, is under a condition where the range of the strong nuclear force exceeds that of the electrical force. He also pointed out that if the range of the strong nuclear force is extended matter would be crushed out of existence. All static forces, including the static nuclear force, are conserved. The range of the strong nuclear force cannot be extended. The range and strength of the dynamic magnetic forces are not conserved. The induced magnetic component of the strong force is the spin orbit force. It can, like the electro-magnetic field, increase in range and in strength. The nuclear spin orbit force has the same curly structure as the electro-magnetic field; however; it is of a nuclear, not of an electromagnetic, origin. It carries the impetus of the strong nuclear force. The action is similar to that of several compasses in close proximity. The magnetic dipoles interact with each other, the composite magnetic field increases, and they tend to flip. A strong, long range nuclear spin orbit interaction would tend to flip nucleons. The flipping of a nucleon induces a beta decay. It converts a neutron into a proton and emits a low frequency condensate anti-neutrino. Larson and Widom also cannot explain how low

energy thermal vibrations regulate a high nuclear process or account for the lack of high energy radiation. This author's result contains no shrunken atoms.

Low energy vibrations have a high energy effect at the scale of a condensed nano-domain. A universal dia-force-field, condition emerges as a consequence of the vibration. The dynamic magnetic fields (electromagnetic, gravitomagnetic, nuclear spin orbit, and weak) are driven to the surface of the particle. These magnetic forces, acting from a macroscopic surface, trigger the chemically assisted nuclear reactions.

This action is not a sideshow confined to an unusual condition within a few odd experiments. The appearance of this phenomenon addresses some long standing fundamental issues. The condition is that of a quantum particle. The action is that of the quantum jump. The action can be extended, through engineering, to trillions of atoms. These atoms can be forced into a single, macroscopic transitional quantum state. Long range nuclear spin orbit and strong gravitomagnetic fields will be induced. This idea is on par with the discovery of Hans Christian Orsted. It shows a way to classically control all of the natural forces. The technologies that follow can provide an unlimited source of clean energy and they may propel us to the stars.

CHAPTER 4 Spacecraft Propulsion

In 1798, Thomas Robert Malthus published "An Essay on the Principle of Population". Malthus wrote that population will always increase in a geometric progression. This growth will quickly outrun the food supply and lead to famine, war, and ill health. He suggested that the poor should not be helped. This relief would only lead to the growth of a more excessive population. As Britain began a period of global colonization this philosophy was applied to the Irish. As predicted, in the short run, a famine ensued in Ireland. The Malthusian philosophy has, however, proved not to hold in the longer run. New lands were colonized and new methods of farming were developed. In 1968, Stanford Professor Paul R. Ehrlich followed through on the ideas of Malthus in his book "The Population Bomb**"**. Ehrlich predicted that the population would overtake the food supply by the late 1970s. A mass starvation would ensue. Ehrlich's predictions seemed to be more plausible than those of Malthus. In the 1970s there were no new lands available on which to offload the excess population. Newly engineered crops and energy intensive methods of farming held off Ehrlich's catastrophe. An unexpected drop in the birthrate also helped to fend off the impending disaster.

In the 1960s many scientists were invited to predict what the world would look like at the end of the 20th Century. Environmental scientist James Ephraim Lovelock made his prediction. In the end, Lovelock was the only one who got it right. He earned considerable credibility as a result of the accuracy of his prediction. He has now stated that population growth, along with an energy intensive lifestyle, have now defeated the earth's capacity to control its chemical and physical environment. He claims, in the second half of the 21st Century that the only inhabitable places on Earth will be at the poles. He has suggested that we should, "*Enjoy life while you can!*" Australian researcher Graham Turner has recently taken another look at this issue within a MIT funded study. Turner has also found that the world is on track for a disaster. He has concluded that world will run out of natural resources. Oil will peak by 2030 and the demand for food and services will rise. The energy intensive farming and food supply system will fail.

In the early 1900s it was believed that the next frontier would be space. Future populations would live in huge spinning space wheels. The rain forests of Venus would be a tropical paradise. Canals could be built, if they were not already there, to bring water from the poles of Mars to its equatorial regions. These projections were wrong. Space travel proved to be extraordinarily difficult. So difficult that, at this moment, the United States has no manned space program.

The first probes to Venus measured its surface temperate and its atmospheric pressure. The surface of Venus roasts at 900 degrees Fahrenheit. That's hot enough to melt lead. The pressure on the surface is ninety atmospheres. Every now and then the whole surface of Venus turns over in a massive volcanic eruption. Venus is no paradise; it is hell. Why was Venus so unexpectedly hot? Comparative planetology was now undertaken. Scientists discovered that a massive concentration of carbon dioxide in the atmosphere of Venus trapped a large amount of heat. This process became known as a runaway greenhouse effect. Man's use of fossil fuels has increased the carbon dioxide content of the Earth's atmosphere. Could a runaway greenhouse effect heat up and kill the Earth?

The first space probes to Mars revealed a cold and a cratered, moon like surface. The lack of carbon dioxide, in the atmosphere, cooled Mars more than expected. Mars is so cold that carbon dioxide solidifies in the winter. As a child I touched dry ice (frozen carbon dioxide). I quickly discovered that the dry ice was so cold that it burned. For a long list of reasons including the lack of a magnetic field, a thin atmosphere, freezing temperatures, and the presence of carcinogenic hexavalent chromium; Mars is not hospitable to life as we know it. It appears that the only home we have, in this solar system, is the Earth. There are a billion-billion starts in the universe. A multitude of planets are now being detected around these remote stars. It has been projected that other habitable planets will soon be discovered.

Rockets must lift the weight of their reaction mass. The Tsiolkovsky rocket equation shows that the payload of the best rockets is limited to a small fraction of this weight. Rockets reach orbit only by shedding pieces of the rocket through a process of staging. Rocket powered manned missions to

Mars will be expensive, long, and dangerous. Rocket technology falls far short at interstellar distances.

In the 1950s nuclear space propulsion was being investigated. Concepts, such as a space born reactor that ejected a stream of fast neutrons, held promise. Such technology could propel a probe to the nearest stars within a lifetime. The launch of a nuclear reactor was wrought with danger. The time frame of this technology was still too long to take people to the stars. Physicist Stanton Friedman, has stated, that a propulsion system that could produce an acceleration of one **g** for one year could transit to the nearest stars within a few years. This kind of technology could take people to the stars; however, it is several orders of magnitude more powerful than any known technology.

A magnetic spaceship that could propel off of the earth's poles has been often proposed. Frank Scully wrote in his 1950 book, Behind The Flying Saucers;

"Now that we have learned that these ships from another world fly magnetically, it is my opinion that our own magnetic engineers will solve the problem of magnetic flight and match the ships of the visitors with saucers made on the earth."

Magnets do push off of each other for a short length; however, the long range force that acts upon a magnetic dipole is purely rotational. A magnocraft produces no translational force. It would just flip over.

There was a great hope that the unification the gravitational and electromagnetic forces would provide an answer. Donald Keyhoe wrote in his 1950 book, The Flying Saucers are Real;

"If gravitation were a manifestation of the electromagnetic force, would it be possible that an advanced race had found a way - as unique as splitting the atom - to offset gravity and utilize that force."

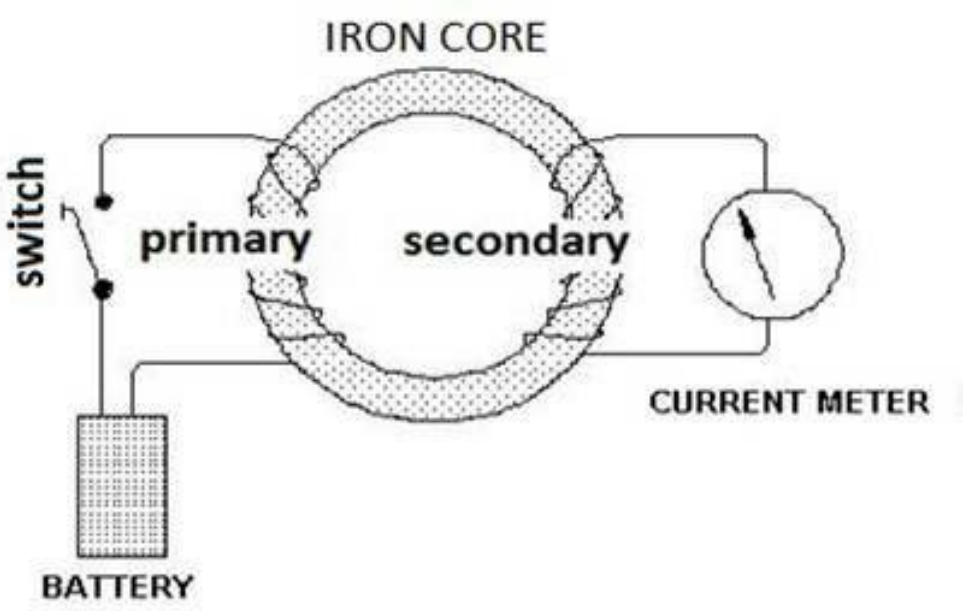
It's been over 100 years since Einstein attempted to find a solution that could unify the natural forces. To date, no simple solution has emerged. It is now believed that a unification of the natural forces will occur at energy levels that will always be out of the reach of man's technology.

The strength of the magnetic action of a solenoid is increased, by a factor of 10,000, upon the insertion of a soft iron armature. This flux amplification

does not require a unification of the natural forces. In the early 1800's, iron core electromagnetic solenoids were inserted into the nascent electrical technologies. Telegraphs, generators, and motors emerged as a result of this application.

Given the reality of this electromagnetic effect, there should be a material or a condition that increases the strength of an induced gravitomagnetic field. Podkletnov has reportedly demonstrated a rotating, vibrating superconductive disk that appeared to produce a strong gravitomagnetic anomaly. An analysis of the quantum transition, later in this text, quantifies this reaction. The induced gravitomagnetic anomaly is not of electromagnetic origin. The effect, like its electromagnetic analog, does not require a unification of the natural forces. The action emerges at very low cryogenic energies. The flux amplification is 10 to the 39 power beyond that of the expected. The strong, induced gravitomagnetic field should react di-magnetically and repel matter. This field may react with the atmosphere and efficiently lift a heavy spaceship into a near earth orbit. In the vacuum of space there is no air to react with. The universe consists mostly of dark matter and, as far as we know, it is evenly distributed throughout the galaxy. Dark matter reacts gravitationally and it may provide a universal source of reaction mass. It may also be possible to directly interact with dark matter at another dimensional frequency. These applications may allow man to effeciently reach orbit and to travel to the nearby stars.

An induced, strong gravitomagnetic field may allow a spacecraft to be propelled without the ejection of reaction mass. Einstein's principle of equivalence states that the inertial and the gravitational mass of matter are inseparable. The inertial mass of matter must be reduced along with its weight. For example, take the case of the electrical transformer.



The Electrical Transformer

The inertial mass of matter is physically equivalent to the impetus of an electrical circuit. The gravitomagnetic field carries the physical momentum of a moving mass. Physical momentum appears as the universe reacts to an induced gravitomagnetic field. Special Relativity has shown that inertial mass can be increased through the application of speed. Internal mass is a dependent property and it is not, in itself, conserved.

Nothing will be felt locally; however, remote regions of the universe will react to the composite gravitomagnetic field. The traveling matter's momentum will be conserved by an increase in its speed. An analysis of the quantum transition, later in this text, quantifies the energy and the direction of this action. The reduction in the inertia of the spaceship will also make existing propulsion systems more effective.

Travel at galactic distances requires superluminal speeds. Contemporary proposals for superluminal travel, such as the Alcubierre Warp Drive**,** depend upon the compression of space time. Starships would travel through this compressed space time at sub-luminal speeds. The compression of space time requires a tremendous amount of energy. Superluminal speeds appear to disrupt the sequence of cause and effect. They also, according to Special

Relativity, require an infinite amount of energy. Superluminal speeds are considered to be inaccessible.

If the reduction of inertial mass can be continued to beyond zero, the inertial mass of the matter will become negative. Just as an electromagnetic coil expels a diamagnetic material, the universe would tend to eject matter with a negative inertial mass. This material would lose mass energy as it accelerates and it would not have the same energetic restriction as ordinary matter. A small piece of it tightly bolted down within a space ship could provide a propulsive source. God only knows how fast or to where a free hunk of this material will go. A ship made entirely of it could pop out of the universe and pop back within another galaxy. The idea of something popping in and out of the universe is one of the strangest in this text. It is; however, not without precedent. The quantum effect of entanglement appears to take a similar route. It provides a useful analog. Is it possible, by such a mechanism, to travel at superluminal speeds without a violation of causality? The development of these advanced applications may allow for unlimited travel.

It appears that a strong gravitomagnetic field can be induced with a low energy technology. This field needs to be produced and studied. The emergence of dynamic quantum effects, on a macroscopic scale, may result in some surprising applications.

The question now is as Fermi has asked, "*Where are they all?*"

CHAPTER 5 The Quantum Mystery

Joseph von Fraunhofer invented the first spectrometer, in the early 1800's. He saw spectral lines within the light of the sun with this device. He used these lines, as reference points, in the design of achromatic lenses. In the mid-1800s, Robert Bunsen and Gustav Kirchhoff heated elements to incandescence within their Bunsen burner. They also saw spectral lines in the light of the hot flame. Johann Balmer produced an empirical equation that described this spectrum. Later in the 1800s, Johannes Rydberg extended Baumer's formulation to the spectra of the heaver elements. Astronomers employed spectral analysis and determined the elemental composition of stellar objects. The early scientists could not, try as they might, produce a causative explanation for the spectral emissions.

In the early 1900s, Max Planck showed that the intensity of the light emitted by a black body was an effect of the quantization of energy. His constant quantified this quantum of energy. Albert Einstein reused Planck's constant and showed that the energy of light is bundled into particle-like photons. Niels Bohr applied Planck's construct to the atomic structure of the atom. Bohr showed that electrons jump between fixed orbits within the atom. The angular momentum, of the atomic orbits, was described a reduced (divided by **2 π)** Planck's constant. The atomic orbits reside at integer squares of the ground state radius. Classical harmonics appear at integer multiples (not squares) of the frequency of the motion. Why are the atomic orbits not spaced harmonically? It was said for this, and other reasons, that the action was not that of classical harmonic motion. It was assumed that the motion mysteriously emerged as a consequence of the non-classical, exclusively quantum property of spin.

Bohr's, solar system like, semi-classical model quantified the emission spectrum of the atoms and determined the chemical properties of the elements. Bohr's principle of quantum correspondence emerged along with the appearance of this model. It states that the square of the amplitude of a classical light wave directly corresponds, in some mysterious way, to the frequency of a photon. According to the principle of quantum

correspondence high frequency photons contain more energy just as large waves contain more energy. High frequency, high energy ultraviolet photons will give a sun burn even at a low intensity. Alternatively, high amplitude, high energy, water waves will knock things down with just a single impact. Bohr's correspondence principle did not identify the root cause this duality and it is incomplete.

According to classical electromagnetic theory of James Clerk Maxwell orbiting electrons should continuously emit electromagnetic energy. Atoms emit packets of energy at random intervals. Bohr's model could not explain the stability of the stationary atomic states, produce the probability of transition, or explain why the frequency of the emitted photon is not coupled to the frequency of the orbiting electron. The frequency of the sound emitted by a speaker, for example, is coupled to the vibration of its cone. No single atomic orbit, or a combination of orbits, vibrates at the frequency of the emitted photon!

The ensuing quantum theory precisely described how an electron jumps; however, it could not explain the emergence of the quantum behavior. A contemporary workaround presumes that the quantum realm is the true reality and that the everyday classical realm appears as a subset within this larger reality. Classical mathematics cannot be applied to the entire domain. Is mathematics a limited, man-made tool that is incapable of simultaneously describing these disparate, regional behaviors? Is there a universal mathematical principle yet to be discovered? Could the aggregate of the disparate behaviors be beyond the reach of mathematics?

Louis deBroglie offered, what has now become, the contemporary interpretation of this dilemma. He proposed that the electron has wave-like properties. The electron does not accelerate around the nucleus, but rather, it encircles it in the form of a standing wave. A particle-like photon is emitted as this standing wave pops and then instantaneously collapses. How does the matter wave contract at an infinite speed?

The emitted photon exists as both a wave and a particle. These properties are mutually exclusive and their simultaneous emergence is a paradox. In an attempt to reconcile these difficulties Bohr introduced his second ad-hoc principle; the principle of complementarity. This principle states that the

frequency of quantum stuff varies linearly with the energy of a thing. The photoelectric effect appears as an expression of this duality. Many problems remained. The energy of an electrical field varies exponentially. Why does the principle of complementarity act linearly? Physicists often skirt these types of problems and state,

"*For small displacements we shall assume that the electrical field is linear*".

The deBroglie wave is a curious mathematical formulation that shrinks and swells with speed. It has no classical analog. No explanation was provided as to why the undulating deBroglie waves do not leak energy through a process of continuous radiation. The problem of the stability of the atom was, in effect, transferred from the orbiting electron to the undulating deBroglie wave.

Max Born attempted to get around these difficulties with his Copenhagen Interpretation. It states that matter's deBroglie wave is not real. Matter's deBroglie's wave is only a subjective construct of probability. This construct exists, only on paper, within a mathematical configuration space. Einstein, Podolsky, and Rosen rejected the subjective nature of this construct and stated their objections in the, now famous, E.P.R. paper.[11]

Einstein maintained, until his death, that the theory of quantum mechanics was not complete. The quantum condition was not reconcilable with Newtonian physics. The renowned Dr. Richard P. Feynman summed it up best in his lecture.

"*But how can it be like that? Because you will get 'down the drain', into a blind alley from which nobody has escaped. Nobody knows how it can be like that.*"

Out Of Feynman's Dark Alley

A ball bouncing off of the Earth is an example of a non-impedance (pronounced em-pee-dance) matched system. The heavy Earth does not rebound from the impact of the light ball. The Earth cannot absorb the balls energy. The ball relinquishes its energy, through friction, in a series of progressive bounces. The sodium coolant within a fast breeder reactor is another example of a non-impedance matched system. Neutrons bounce off of the heavy sodium nucleons without imparting much energy. The neutrons are not slowed (thermalized) by the interaction. The neutrons maintain enough kinetic energy to initiate fuel breeding fission reactions.

A billiard ball directly impacting another billiard ball is an example of an impedance matched system. The incoming ball stops and the outgoing ball flies away with all of the kinetic energy. One snap of sound is emitted. The kinetic energy is transferred promptly; without bounce. The speed of the exiting billiard, neglecting friction, is that of the incoming billiard.

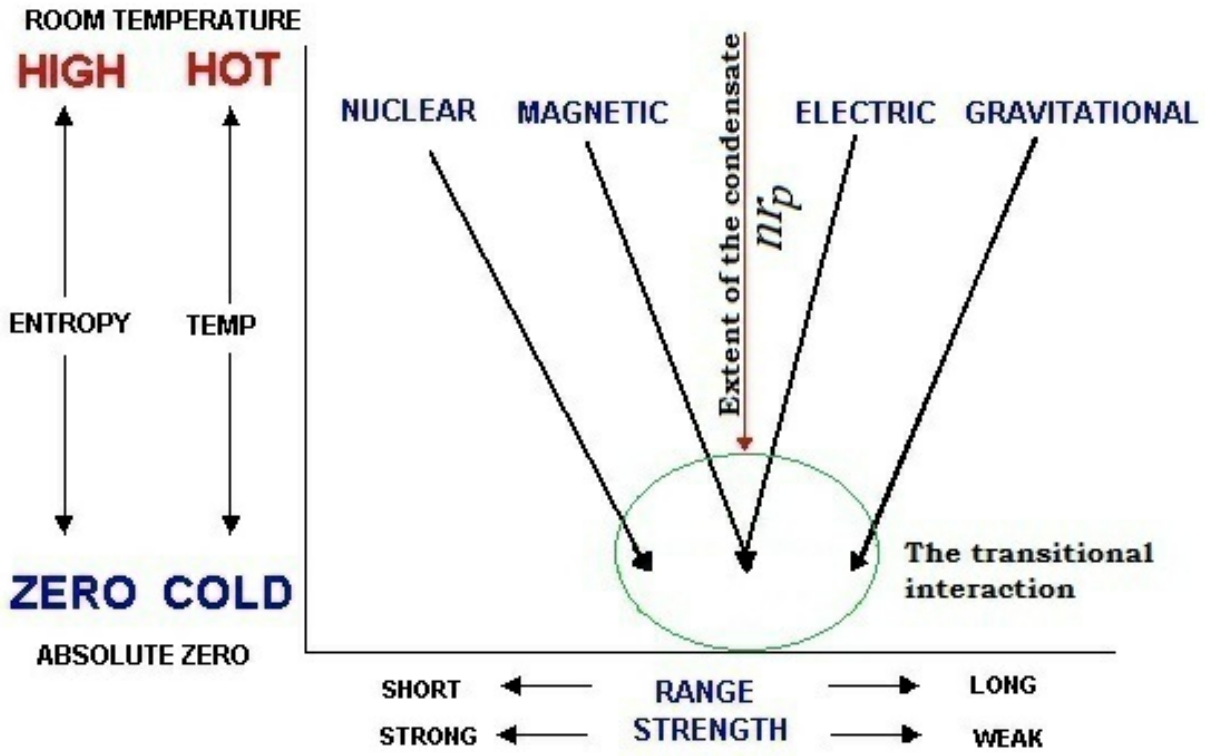
Electrons attempt to take all possible paths into the nucleus. Hugh Everett suggested that the universe splits and every possible path is realized within a multitude of universes. Atomic transitions emit a single photon; not a progressive series of lower energy photons. The emission, of a single photon, demonstrates that quantum transition is a prompt, single step process. A complete transfer of energy, within a single step, is a characteristic of an impedance matched system. The energy of the universe does not split into multiple universes. It promptly flows through a single channel of matching impedance. This path is characterized by a match in the speed of the interacting partners. The electric field is inelastic. Electrons do not bounce; they give up their energy in a single step. Electrons transit, between atomic states, through channels of matching impedance.

In the late 20th Century Frank Znidarsic observed a speed of 1,093,850 meters per second within some low energy nuclear and gravitomagnetic experiments. He concluded that this is the speed of sound within the nucleus $\mathbf{S_n}$. The electron couples with this speed during the quantum jump. The

action affects conserved properties. Energy, momentum, and charge are conserved.

When an irresistible force meets an unmovable object something has to give. The properties that yield, during the quantum transition, are the non-conserved properties. The non-conserved magnetic components of the force fields are profoundly affected. The electrical magnetic force, the gravitomagnetic force, and the nuclear spin orbit magnetic force are ejected from the system. The flux is driven to surface of matter where it is forced into a convergence of range and strength. The action resembles that of a magnetic amplifier where a strong magnetic field, which is applied from the outside of its core, effectively destroys the inductance of the core. Likewise, a decoupling of the gravitomagnetic flux from matter destroys the matter's inertial mass. Special Relativity demonstrates that inertial mass is not a conserved property. It increases with the addition of speed and it may be mutable under other conditions. Impedance is a function of mass and speed. The inertial mass of matter mutates during a quantum transition, the impedance of the systems is matched, and the quantum jump proceeds promptly at the speed $\mathbf{S_n}$.

The mathematical quantification of this speed has led to an "impedance matched interpretation" of quantum physics. This quantification shows that the quantum realm emerges as the non-conserved components of the wave function instantaneously collapse and the conserved components interact at a speed of 1,094,000 meters per second. The effects are not probabilistic, do not require a multitude of universes, and have no pilot waves. The interpretation has shown a way out of Feynman's dark alley. This tendency is displayed graphically on the next page.



THE RANGE OF FORCE INTERACTION

CHAPTER 6 The Mathematics

A Refactoring of Coulomb's Equation

In the 18th Century Charles-Augustin de Coulomb gave the force produced by interacting electrical charges (1). This force varies inversely with the square of the displacement $\mathbf{r^2}$.

$$Force = -\left(\frac{Q^2}{4\pi e_o}\right)\frac{1}{r^2} \qquad \#1$$

The mathematical operation of the integration of (1) gives (2) the energy of interacting electrical charges. This energy varies smoothly with the reciprocal of the displacement **r**.

$$Energy = \left(\frac{Q^2}{4\pi e_o}\right)\frac{1}{r} \qquad \#2$$

James Clerk Maxwell extended Coulomb's result and went on to produce the speed of light **c**. Coulomb's and Maxwell's formulations were a crowning achievement of classical physics. These results describe much of man's contemporary electrical technology.

The electrical field does not appear to be compressed, stretched, or distorted. Where is the energy of the electrical field stored? How does an invisible field impose a force? Planck's constant was not produced from any fundamental classical argument. It is empirical. The contemporary explanation states that the quantum domain is the true realm. The everyday classical universe appears, like an illusion, as the quantum domain is smeared out. Today, one Century later, scientists no longer question these difficulties and they use Planck's constant ubiquitously.

The Refactoring

The properties of the classical universe are bounded at maximums. For example, there is only so much money, energy, and time in your life. Likewise, the elasticity of a spring is limited. It breaks down when subjected to a force that is beyond its limit. The force exerted by two electrical charges, compressed to within one classical radius $\mathbf{2r_p}$ of each other, is $\mathbf{F_m}$ (**29.0535** Newtons). The rigid electrical field buckles when subjected to the force $\mathbf{F_m}$. The theory of a point-like electron being able to buttress an infinite amount of force fails at the classical radius $\mathbf{2r_p}$ of the electron.

The electrical force was quantified as the product of a variable pressure ($\mathbf{F_m/\pi r^2}$) acting upon the area of a section of a bubble $\mathbf{\pi(2r_p)^2}$. The form factors ($\mathbf{\pi}$) cancel within the solution (3). Equations (1) and (3) yield identical forces; however, equation (3) exposed the action. The electrical field produces a force in reaction to an elastic discontinuity. An analysis suggests that that capacitance of a particle of radius $\mathbf{2r_p}$ is an effect of a universal minimum of stray capacitance.

$$Force = -\frac{F_m}{r^2}\left(2r_p\right)^2 \qquad \#3$$

The integration of the equation (3) gave (4).

#4

$$Energy = \frac{F_m}{r}(2r_p)^2$$

Equation (4) gives the energy of interacting electrical charges. The form of equation (4) is that of two superimposed mechanical springs **2(1/2Kx^2)**. The electrical field buckles when subjected to the force **F_m**. The buckled field only opposes a constant of force. The rest energy of the electron is contained as the linear product of this force **F_m** and the displacement **$2r_p$**. The electric field buckles sooner at radii **r** where it is weaker. The elastic discontinuities act upon the electric field at a reduced force at these radii. These actions fix the rest energy of a local electron and contain the potential energy of a remote electron. The elastic constant **(F_m/r)** appeared as a factor of the motion.

The electron behaves like a ball of plumber's putty, it does not bounce, it promptly surrenders all of its kinetic energy, and it is reconfigured through a process of elastic failure. The quantification of this behavior, in (4), produced the same potential energy as did Coulomb's equation (2). Both equations (2) and (4) describe a large portion of classical reality.

The spring like formulation (4) introduced the elastic constant **(F_m/r)**. Like that of a rubber band, this elastic constant diminishes inversely with the displacement **r**. The elastic constant, of a spring, expresses a relationship between force and displacement. This restoring force, acting upon a mass, produces a resonant harmonic motion. This motion oscillates in time. Matter's wave-like properties emerge as a classical effect of the elastic factor.

The wave number converts a length into an angle. The angle can then be read by a trigonometric function. Equation (4) introduced the length **$2r_p$**. This length was used to set the wavelength **λ** of the electrical field's wave number **(2π/λ)**. The wave number describes amplitudes that undulate with position. Matter's particle-like properties emerge as a classical effect of this

action. These results, taken together, produced Planck's constant and reconciled the duality of matter and waves. The production of quantum results from, a classical argument is a revelation. The solution invokes limits, not infinities. It shows that the quantum minimums depend upon a classical maximum.

The domain of equation (4) extends smoothly across the exponential classical realm and then, at the radius $\mathbf{2r_p}$, it bumps into an elastic discontinuity. The quantum realm appears linearly and smoothly on the other side of the discontinuity. The elastic constant $\mathbf{(F_m/r)}$ acts linearly within the linear, quantum region. The linear relationship, described by the principle of complementarity is established as an effect of this linear action. Assumptions of linearity are no longer required. The electrical field really is linear at small displacements.

The smooth regions can be described with mathematics; however, the discontinuity at their boundary exists outside of the mathematics. The discontinuity was discovered and imposed. It did not emerge from any anthropic, mathematical analysis. Its singular existence, outside of the mathematics, shows that the natural realm is beyond mathematics. It also shows that that mathematics was invented, not discovered, and it is just a useful tool. The imposition of an elastic boundary replaced many ad-hoc quantum principles, eliminated quantum paradoxes, precisely defined the limits of the quantum domain, and led to a homogenous description of reality.

An extrapolation of (4) produced new results. These results include methods to control all of the natural forces and techniques that could reduce inertial mass. The technologies that may come from these understandings may take mankind to the stars.

The Speed of Hydrogen's Electrons

A type of notation came out of early spectroscopy (5). It describes the amplitude **Y** of a traveling wave in space and time. Its first term is called the wave number **(2π/λ)**. The wave number describes a wave's amplitude at point **x**. Wave numbers exist, within traveling waves, at integers of the fundamental length **n**. Its second is called the angular frequency **ω**. The angular frequency describes an oscillation at time **t**. Harmonics **n** of the angular frequency do not exist within traveling waves.

$$Y = cos\left(\frac{2\pi n}{\lambda}x - \omega t\right) \quad \#5$$

An oscillation at the angular frequency of **ω** is produced as an elastic medium tugs upon a mass. The frequency of this type of motion is routinely quantified as the square root of the ratio of an elastic constant (**K_e-**) to a mass (**M_e-**). The length of the wave number **λ** was set to the classical radius of the electron is **$2r_p$**.

$$Y = cos\left(\frac{2\pi n}{2r_p}x - \sqrt{\frac{K_{e^-}}{M_{e^-}}}t\right) \quad \#6$$

A standard solution of (6) is the angular frequency divided by the wave number. Divide by taking the reciprocal of the wave number times the square root. The result (7) is a speed. The elastic constant $\mathbf{K_e}$- was expanded in (7) into the ratio of $\mathbf{F_m}$ over the radii of the hydrogen atom ($\mathbf{n^2 r_h}$).

$$S = \frac{2r_p}{2\pi n}\sqrt{\frac{F_m/(n^2 r_h)}{M_{e^-}}} \qquad \#7$$

Equation (7) was simplified and the right side was multiplied by a factor of $\mathbf{2\pi}$ to give a circumferential speed in (8). Circumferential speeds emerged in (8) as fractions $\mathbf{(1/n^2)}$ of the product of the displacement $\mathbf{2r_p}$ and the angular Compton frequency of the electron (the Sq. Root). There is no component of this speed propagating the radial direction. The state is known, because of this lack of radial motion, as a stationary quantum state.

$$S_{e^-} = \frac{2r_p}{n^2}\sqrt{\frac{F_m/r_h}{M_{e^-}}} \qquad \#8$$

The result $\mathbf{S_e}$- equals 2.19 million meters per second divided by the square of number of the atomic orbit **n**. These speeds are of those of the orbiting electron in the hydrogen atom. The result demonstrates the efficacy of the elastic constant and the wave number.

The orbiting electron induces an electromagnetic magnetic moment. No strong gravitational or long range nuclear forces emanate from an orbiting electron.

The Speed of Sound in the Nucleus

Niels Bohr described the nucleus, in 1936, as a stiff, high density (2.3×10^{17} kg/m^3) drop of liquid. The field of nuclear physics was developed greatly from that time, however, the speed of sound in the nucleus was never seriously considered. As with all substances, the nuclear fluid conveys sound at a speed based upon its density and elasticity. The density of the nucleus is known to be constant. The nuclear density is independent of the number of neutrons or the number of protons. This implies that the forces that act upon the nucleons are nearly constant. This consistency in density and elasticity fixes the speed of sound within the nucleus.

The Equation (9) describes a standing wave as the product of the cosine of its wave number and the sin of its angular frequency **ω**. Notice that a traveling wave was formulated as a difference in (5) and that a standing wave was formulated as a product in (9). These forms are standard. Harmonics **n**, of the natural frequency **ω** of a standing wave, exist. Harmonics**,** of the wave number, of a standing wave do not exist.

$$Y = cos\left(\frac{2\pi}{\lambda}x\right)sin(n\omega_n t) \qquad \#9$$

The expansive electrical force, acting between protons, is balanced by the attractive strong nuclear force. The composite field has stiffness of twice that of the electrical field. The angular frequency of the nucleons $\boldsymbol{\omega}_n$ was determined by taking the square root of twice that of the electrical elastic constant $\mathbf{K}_e$- divided by the proton's mass $\mathbf{M}_p$. The elastic constant was inserted into (9) producing (10).

The nucleus is built of alpha particles as a wall is made of bricks. The nucleons, within an alpha particle, squash together and their spacing becomes less than the diameter of a proton. The nucleons, within an alpha particle are

crushed to a point where the strong nuclear force becomes repulsive. The nucleon spacing has been determined by the scattering of these alpha particles.[34, 37] This spacing $\mathbf{K}_f$ equals 1.36 Fermis. The reciprocal of this spacing is known as the Fermi wave number. The length of the nuclear spacing $\mathbf{K}_f$ was inserted into the wave number in (9) producing (10).

$$Y = cos\left(\frac{2\pi}{K_f}x\right)\ sin\left(n\sqrt{\frac{2K_{e^-}}{M_p}}t\right) \quad \#10$$

A solution of (10) (again the angular frequency divided by the wave number) gave a speed in (11). The electronic elastic constant $\mathbf{K}_{e^-}$ was expanded and set to the Fermi displacement length $\mathbf{K_f}$. The longitudinal motion of a sound wave does not require an additional factor of **2π**. Equation (11), expresses speed as the product of a frequency [**(1/2π)ω**] and the displacement $\mathbf{K_f}$. The result is the speed of sound in the nucleus.

$$1{,}093{,}850\ m/s = \frac{n}{2\pi}\sqrt{\frac{2F_m/K_f}{M_p}}K_f \quad \#11$$

The speed of a wave varies with its frequency in some media. A prism is an example that employs this type of motion. The wavelength of a nuclear disturbance is fixed at the displacement $\mathbf{K_f}$. Speeds appear with harmonics **Z** of the nuclear frequency.

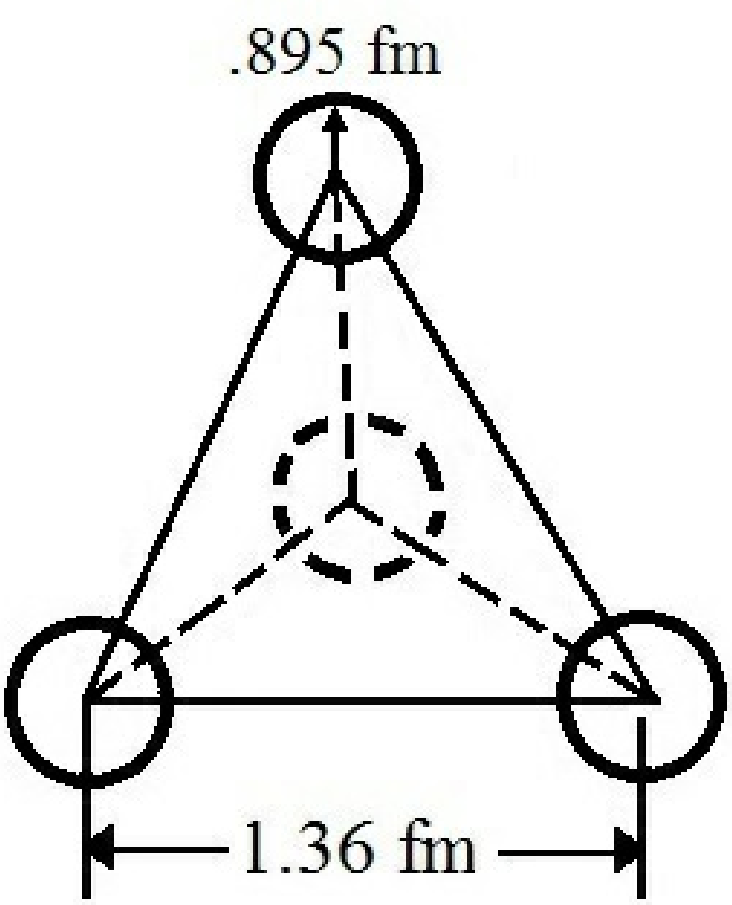
The speed of sound in the nucleus was determined between protons at the Fermi scale. The consistency of the nuclear density implies that this speed $\mathbf{S_n}$ is independent of scale. This speed is also exhibited within an isolated nucleon and at the atomic scale, within the active environment of a low energy nuclear reaction. More generally, the speed is that of a longitudinal matter wave. It is an independent natural constant. The speed appears to be only slightly affected by the presence of neutrons.

The strength of the atomic chemical bonds increases with the number of neutrons. This relationship is known as the kinetic isotope effect. An increase in the strength of the atomic bonds is the reason why heavy water is toxic. The relationship suggests that the quantization of the atomic orbits is established through an action of the nucleus.

This author's impedance matched interpretation of quantum physics quantifies this action. It states that $\mathbf{2\pi n}$ times the speed of a transitional electron equals a harmonic **Z** of the nuclear speed. The classical harmonics (**n** and **Z)** propagate at multiples of the nuclear speed $\mathbf{S_n}$.

$$\mathbf{ZS_n = 2\pi n} \text{ (speed of the transitional electron)}$$

The sonic nuclear speed is a fundamental classical constant. The quantum condition emerges as an effect of its action.



The tetrahedral arrangement of bound nucleons

The Principle Orbits of the Hydrogen Atom

Maxwell's theories predicted that accelerating electrons will continuously emit electromagnetic radiation. This loss of energy will drive a spiraling electron into the nucleus. Bound electrons experience a constant centripetal acceleration; however, they do not continuously emit energy. Atoms emit random bursts of energy as their electrons jump between a set of allowed atomic orbits. These allowed orbits were quantified, by Bohr and Schrödinger, as points containing multiples of Planck's quantity of angular momentum. This qualification has no classical analog and, as such, has led us down into Feynman's dark alley. There we have remained stuck for over 100 years.

The motion of a standing wave is expressed by equation (9). The fundamental frequency, of a standing wave, is one-half of a wavelength (**λ /2**). The length of the wavenumber **λ** was set to one half the classical radius of the electron $\mathbf{r_p}$ (12). As before, the angular frequency **ω** was expressed as the square root of the elastic constant $\mathbf{K_e}$- divided by the mass of the electron $\mathbf{M_e}$-.

$$Y = cos\left(\frac{2\pi}{r_p}x\right) sin\left(n\sqrt{\frac{K_{e^-}}{M_{e^-}}}t\right) \quad \#12$$

Standing waves, by definition, do not propagate. A solution of (12) (again the angular frequency divided by the wave number) produced a speed $\mathbf{S_e}$- in (13). The electron moves between harmonics **n** of the natural atomic frequency at the speed $\mathbf{S_e}$-. The principle quantum number **n** emerges as an effect of these harmonics.

#13

$$S_{e^-} = \frac{n}{2\pi}\sqrt{\frac{K_{e^-}}{M_{e^-}}}\, r_p$$

If you are bored or lost, hang on, we are getting best part of this story. To understand the importance of what we are about to do, you have to go back to early 20th Century. In 1913, as Niels Bohr was presenting has quantum atomic model Ernest Rutherford wrote,

"*There appears to me one grave difficulty in your hypothesis, which I have no doubt you fully realize, namely how does an electron decide what frequency it's going to vibrate at when it passes from one stationary state to another? It seems to me that you have to assume that the electron knows beforehand where it* is *going to stop.*"[32]

In 20th and 21st Century a great effort was undertaken building accelerators that searched for an answer to Rutherford's question. No answer was discovered within the high energy physics. Surprisingly, an answer to Rutherford's question was gleamed from the observation of low energy nuclear experiments. The answer was presented with the use of the equal sign in (14). The speed of a transverse electrical wave $\mathbf{S_e}$- was set equal to the speed of a longitudinal matter wave $\mathbf{S_n}$. This speed is that of a jumping electron. In more general terms the speed of light, in the atom, was set equal to the speed of sound. This equality determined the frequency of the jumping electron, fixed the energy levels of the atom, matched the impedance of the interacting partners, and revealed why the ground state atomic orbit does not radiate. The equal sign in (14) may be the most important one in the natural world. How was it missed for so many years? The elastic constant in (13)

was expanded in (14). A factor of **2π** was injected into the right side of (14) as per this author's impedance matched interpretation of quantum physics. Hydrogen's electron interacts with the fundamental nuclear speed.

$$S_n = n\sqrt{\frac{F_m/r_a}{M_{e^-}}}\, r_p \qquad \#14$$

The transient stability of the atom is established through the pinning action of the elastic discontinuity $\mathbf{r_p}$. Resonant vibration breaks the electron free from the grip of the elastic discontinuity. The electron is reconfigured, through a process of elastic failure, as it flows through a channel of matching impedance. This channel of matching impedance is characterized by a match in the speed of the interacting partners. There is no component of this speed propagating circumferentially around the atom. The state moves radially inward and radially outward with a change in the harmonic **n** of the natural frequency. The speed of this radial movement is the speed $\mathbf{S_n}$. The radial motion is one of quantum transition. Equation (14) described the speed of the radial motion.

Bohr's construct, of the quantization of angular momentum, is dependent upon the conditions expressed in (14). Equation (14) was solved for the unknown atomic radii $\mathbf{r_a}$ (15).

$$r_a = n^2 \left[\frac{F_m \, r_p^2}{S_n^2 \, M_{e^-}} \right] \qquad \#15$$

The length **.529** angstroms emerged as the terms within the brackets **[ ]** were reduced. This length is that of the ground state radius $\mathbf{r_h}$ of the hydrogen atom. Hydrogen's principle orbits $\mathbf{r_a}$ exist at integer squares $\mathbf{n^2}$ of the ground state radius. The radii of the hydrogen atom depend upon the speed of sound in the nucleus

$$r_a = n^2 r_h \qquad \#16$$

The electron attempts to take all paths into the nucleus. The only open paths are ones of matching impedance. These paths were quantified in terms of their speed. This speed is that of the transitional quantum state. The principle energy levels of the hydrogen atom emerged, from speed, within a framework of Newtonian mechanics.

The Radii of the Heavy Elements

The effect of multiple overlapping electric charges **Z** increases the elastic constant $\mathbf{K_e}$- of the system by a factor of **Z**. This factor of **Z** was inserted into (12) and produced (17). The wave number, as expressed by $\mathbf{r_p}$, does not vary with atomic number or frequency. It is an independent natural constant. The harmonic motion associated with heaver, high **Z,** elements was described in (17).

$$Y = cos\left(\frac{2\pi}{r_p}x\right) sin\left(n\sqrt{\frac{ZK_{e^-}}{M_{e^-}}}t\right) \quad \#17$$

A solution of (17) (Again the angular frequency divided by the wave number) gave the speed $\mathbf{S_n}$ in (18). A factor of **2π** was injected into the right side of (18) as per this author's impedance matched interpretation of quantum physics. A harmonic **Z** of the nuclear speed $\mathbf{S_n}$ is selected by an orbital restriction; where the orbital frequency couples with the electron's natural frequency

$$ZS_n = n\sqrt{\frac{Z(F_m/r_a)}{M_{e^-}}}\ r_p \quad \#18$$

A solution of (18) produced (19) the atomic radii $\mathbf{r_a}$ of the single electron higher **Z** atoms. The energy levels of the heavy elements also exist as points of matching impedance. The principle energy levels, of all of the elements, emerged from speed within a framework of Newtonian mechanics.

#19

$$r_a = \frac{n^2 r_h}{Z}$$

The flash and the bang of the quantum transition propagate simultaneously. A single photon is emitted in concert with this prompt action. The motion was quantified through an equality in speed.

The natural forces participate in the prompt, bounce-less transition. The strength and the range of the magnetic components of the natural forces are driven into a convergence. The kinetic energy of the transitional electron is balanced by the negative potential of an induced strong, local gravitomagnetic field. The channel of matching impedance extends from the atomic electrons all the way to the nucleus. The nuclear forces participate in the reaction. Nothing rattles. The diamagnetic condition reduces the inertial mass of the transitional electron. The mass energy flows between the energy levels of the atom at 1,093,850 meters per second (**S_n**). The effects are spooky. The action opens a route through which the impedance matched quantum transition promptly proceeds.

Quantum Spin

In 1922, German physicists Otto Stern and Walther Gerlich conducted an experiment that measured an electron's spin. Electrons were passed through a powerful magnetic field. A spinning electron induces a tiny magnetic dipole. They expected that the electrons would enter into the external magnetic field with their magnetic dipoles pointing at random angles. The interaction of the applied field, with the electron's magnetic dipole, would deflect the electrons at random angles. They discovered something that was quite unexpected; the electrons were all deflected either up or down at the same angle. The electron appeared to be spinning either up or down. No electrons, spinning at other angles, were observed. They then preset the spins with another magnet prior to sending them to the detector. As before all of the electrons emerged from the second detector either in a spin up or in a spin down configuration. The preset condition, of the electrons, only affected the probability of detecting a spin up or a spin down configuration. No existing classical model could explain this discrete behavior. It was said that the emergence of this behavior demonstrated that quantum realm was beyond the reach of Newtonian physics. The properties, within the quantum realm, appeared to be affected by the bias of the observer.

The contemporary description of the quantum condition is based upon a minimum of angular momentum. This minimum of angular momentum was described by a reduced Planck's constant. A mathematical operation, called the cross product, is used to quantify angular momentum. Angular momentum is product the momentum (**Mv**), acting in a direction normal to (**a-cross**) the surface of a lever arm, times the length **r** of the lever arm. The principle orbits of all of the atoms, heavy and light, contain the same quantity of angular momentum. No factor of the atomic number **Z** is required. Physicists have found the simplicity of this foundation to be irresistible. A multitude of intractable problems have emerged with the interpretation of the model. Most importantly, the Bohr model does not offer a classical explanation for the property of quantum spin.

This author produced the elastic constant of the electron. This elastic

constant varies inversely with displacement. Perhaps it should be called the elastic factor. An affect can be observed when blowing up a balloon. The balloon gets easier to blow up as it expands. The elastic constant of the balloon decreases as the thickness of the balloon's membrane decreases. Likewise, the elastic constant of the electric field decreases with displacement. The factor of **r** in the denominator of the elastic constant quantifies this relationship. The electric field's elastic constant appears on the right side of this author's equations. This factor of **r** in the denominator on the right side of the equation eliminates the need for a factor of **r** in the numerator on the left side of the equation. The equality becomes one of a speed (**v**) not angular momentum (**Mvr**).

This author's impedance matched interpretation of quantum physics emerged from this equality. The impedance matched interpretation of quantum physics states that $\mathbf{2\pi n}$ times the speed of a transitional electron equals a harmonic **Z** of the longitudinal nuclear speed. The atom's orbital velocity emerged (5) as a consequence of a wave number and an elastic constant. The direction of the orbital velocity is not quantized. The energy carried by the motion can vary with the direction of the motion. These structures can store variable amounts of energy and do bounce. These structures tend to bounce away their energy and to congregate at the lowest energy level. The action is that of a spin one state. It is described with Bose Einstein statistics. This author's analysis has shown that the spin one state emerges as a consequence of a wave number with a length equal to the classical radius of the electron $\mathbf{2r_{p.}}$

The atomic energy levels emerged (9) from the standing vibrations of the electron. These standing waves vibrate harmonically and store discrete amounts of energy. They do not bounce. The action is that of a spin one-half state. It is described by Fermi Dirac statistics. This author's analysis has shown that the spin one-half state emerges as a consequence of a wave number with a length equal to one half the classical radius of the electron $\mathbf{r_{p.}}$

This author's foundation is not as simple as that of Bohr model because it does require a factor of **Z**; however, it does provide a Newtonian explanation for the property of quantum spin. The quantum spins emerge as effects of a classical pair of wave numbers.

The impedance matched interpretation describes quantum interactions in terms of speeds. These speeds, more correctly, velocities, act orthogonally (at right angles) to each other. Equation (18) gave the principle radii of all of the elements. Vector notation was inserted into (18). The vector cross product (20) was produced. The longitudinal velocity $\mathbf{S_n}$ is an independent constant. The vectors $\mathbf{S_n}$ and **i-hat** point radially outward. The vector $\mathbf{r_p}$ points in the direction of the electron's velocity. The result of the cross product points at right angles to the electron's velocity. Equation (20) presents the orthogonal relationship of the transverse and longitudinal motions.

$$Z\vec{S}_n = n_1\sqrt{\frac{ZF_m/(n_2^2 r_g)}{M_{e^-}}}\,\hat{\imath}\,x\left(\pm\vec{r}_p\right) \qquad \#20$$

The discontinuity $\mathbf{r_p}$ binds the longitudinal $\mathbf{S_n}$ and the transverse $\mathbf{r_p}$ motions together. These motions are spun into an orthogonal alignment by the application of an external magnetic field. The application of the magnetic field imposes the bias of the observer. Two points of energetic accessibility open with the alignment. The Stern Gerlich effect appears as an effect of this energetic accessibility.

A factor of $\mathbf{2\pi}$ naturally emerges with the orthogonal orientation of the longitudinal and transverse velocities. This is the factor of $\mathbf{2\pi}$ that appears within this author's impedance matched interpretation of quantum physics. The interpretation provides an explanation for the factor of $\mathbf{2\pi}$ that appears within the reduced Planck constant.

The product of the integer squared $\mathbf{n_2^2}$ and the ground state radius $\mathbf{r_g}$ sets the

electron's elastic constant. This product expresses the atomic radii. Classical, integer harmonics $\mathbf{n_1}$ appear with the square root these radii. The squared atomic radii emerge harmonically as effects of the variable elastic constant.

The action of the classical spins also establishes the fine atomic structure. An equality in the factors (20) of **n** holds the Compton frequency of the bound electron constant. This is the condition of the spherical **S** atomic orbit. The **S** orbital contains two orthogonal states. One is spin up ($+\mathbf{r_p}$) and the other is spin down ($-\mathbf{r_p}$). The principle atomic orbits ($\mathbf{n_1, n_2, n_3 \ldots}$) are described by an equality in the factors of **n**.

A harmonic of the Compton frequency $\mathbf{n_1}$ can be one within the second principle ($\mathbf{n_2=2}$) atomic orbit. The Compton frequency, of the electron, downshifts under this condition. It will be shown (30) that this downshift in frequency, taken to the extreme, is also responsible for the low energy nuclear effect. The equality in velocity is maintained by a tilting in the axis of electron's orbit. The precession (wobbling motion), of the orbit, is fettered to a fraction of the nuclear velocity. The cross product quantifies the tilt. The tilt of the orbit is described by the angular momentum quantum number ***l,*** where ($\boldsymbol{l} = \mathbf{n_2}-\mathbf{n_1}$). A peanut shaped **P** orbit is traced out by the precession of the orbit. The orbits of the **P** states fit into positions that are orthogonal to each other. **P** states reside along each axis **X**, **Y** and **Z**. The sum of the two **S** states and the six **P** states equals eight points of matching impedance. The second principle orbit ($\mathbf{n_2=2}$) of the atom can hold eight electrons. When filled, the eight electron structure is chemically stable. The analysis can be extended to all of the atomic orbits. These motions are like those of a wobbling top. The shapes of the sub orbitals emerge as effects of the orbital precession.

The fine atomic structure emerged as effects of classical pair of wave numbers and a classical elastic constant. This fine structure determines the chemical properties of the elements.

The Spectral Intensity

The spectral lines, emitted by glowing matter, vary greatly in intensity. Bohr's semi-classical atomic model could not account this variation in intensity. Werner Heisenberg offered a solution that arranged the properties of the atom on a matrix. Planck's empirical constant was inserted ad-hoc, by Heisenberg, into the formulation as a commutative property of matrix multiplication. Heisenberg's solution gave the intensity of the spectral emissions and established the field of quantum physics. The formability did not, however, reveal the underlying action.

Louis deBroglie proposed that matter is a wave[42]. Erwin Schrödinger incorporated deBroglie's wave into his wave equation. Schrödinger's result also produced the intensity of the spectral emissions. Schrödinger's introduction, of the deBroglie wave, produced a clearer solution but, in the process, it introduced many conceptual problems. Schrödinger's wave equation is scalar. It does not incorporate any restraining forces. What forceless mechanism bundles the deBroglie wave into to a particle? How can the electron be both a point-like particle and a disperse wave? How is a photon released from the bondage? Bohr's principle of quantum correspondence was invoked in an attempt to explain why the energy of a photon is associated with frequency and the energy of a classical wave is associated with amplitude. Schrödinger injected Planck's empirical constant ad-hoc into his solution. Heisenberg and Schrödinger knew nothing about the path of the quantum transition. Their solutions did not directly incorporate a probability of transition.

Max Born's Copenhagen Interpretation suggested that the mater wave is restrained by a Fourier superposition of an infinite number of probability waves. A particle emerges with the immediate collapse of these probability waves.

"*By which strange coincidence could a representation of the probabilities propagate in space through time like a physical wave able to be reflected,*

refracted and diffracted?"

Louis deBrogle

Max Born did not extend his Copenhagen Interpretation beyond the electromagnetic interaction and, for this reason; he could not produce a classical explanation for the restraint and the release of matter and energy. This author's model does extend to all of the natural forces and it was built upon a classical foundation.

In 1916 Einstein published the famous paper "Emission and Absorption of Radiation in Quantum Theory". This paper stated that the probability of transition could be increased through the action of an external stimulation. This stimulative process was applied, in a limited way, to the development of the LASER. Znidarsic observed a stimulative process at work within low energy nuclear reactions. The action of this stimulative process is universal. The energy of the matter wave transitions at the sonic nuclear speed $\mathbf{S_n}$ (1,093,850 meters per second). The probability of transition is proportionate to the square of the amplitude of vibration at the speed $\mathbf{S_n}$. The gravitomagnetic, electro-magnetic, and nuclear spin orbit force fields are driven out of the system and the range and the strength of the force fields converge. This vibration destroys the inertial mass of the electron and opens a channel of matching impedance. Atomic transitions progress through these open channels. The intensity of the particle like electrons emerging at the screen in the double slit experiment depends upon the magnitude of this vibration. The motion, free of this vibration, is that of a wave. This is the state of the electron that transitions through the slits within the double slit experiment.

In review, the condition of the hydrogen's stationary atomic states was described by (15).

$$r_a = n^2 \left[\frac{F_m \, r_p^2}{S_n^2 \, M_{e^-}} \right] \quad \#15$$

The action of the transitional quantum states will now be unveiled. This author's impedance matched interpretation of quantum physics describes the motion of the transition quantum state. Transverse atomic vibrations couple with the longitudinal nuclear speed during transition (22). This multi-force-field action opens a channel of matching impedance and emits a photon. Chemically assisted nuclear reactions are induced by an intense vibration at this frequency

$$S_n = 2\pi n \text{ (light speed in an atom)}$$

The transitional speed was refactored (23) as the product of the atomic frequency $\boldsymbol{f_a}$ and the circumferential wavelength $\mathbf{2\pi r_a}$. Harmonics **n** of the frequency $\boldsymbol{f_a}$ exist.

$$S_n = (2\pi n f_a) r_a \quad \#23$$

The sonic nuclear speed and the atomic radii are not directly observable. The union of equations (23) and (15) injected the transitional frequency $\boldsymbol{f_a}$ into the solution (24). Equation (24) describes the amplitude of the energy of the

transitional electron in terms of the observable frequency of its emitted light. The frequency of the light emitted by an atom is not that of any stationary atomic state; however; the frequency is that of the transitional atomic state.

$$r_a = n^2 \left[\frac{F_m \, r_p^2}{(2\pi n f_a) \, r_a \, S_n \, M_{e^-}} \right] \qquad \#24$$

The amplitude squared $\mathbf{r_a^2}$ emerged in (25) with the reduction of (24). This amplitude is that of the transitional quantum state. The series of a group of spectral emissions is represented by the integer **n** (ref. plot on the next pages).

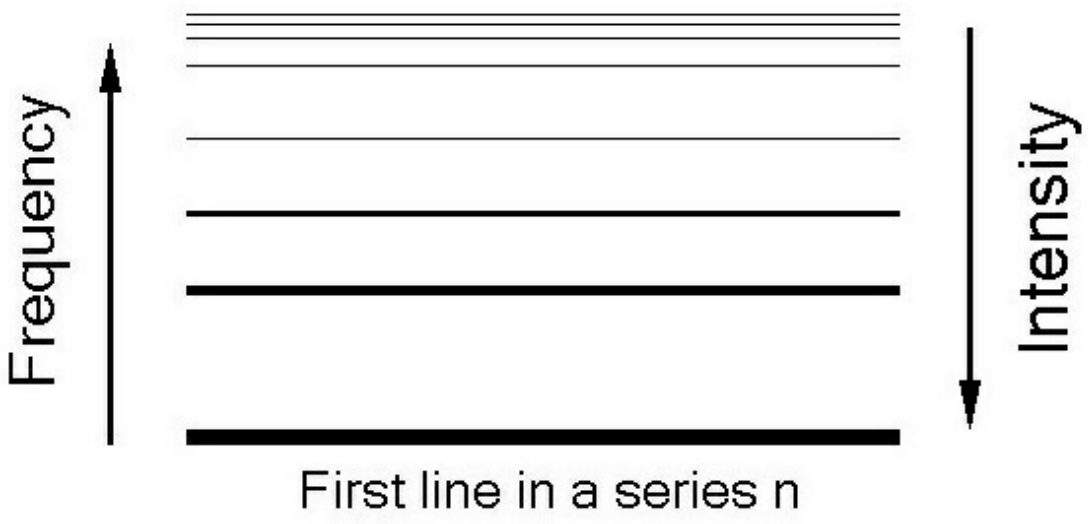
$$r_a^2 = n \left[\frac{F_m \, r_p^2}{(2\pi f_a) \, S_n \, M_{e^-}} \right] \qquad \#25$$

The constants in equation (25) were regrouped in (26) and the numerator and denominator were multiplied by a factor of **4π**.

$$r_a^2 = \left[\frac{4\pi \, F_m \, r_p^2}{S_n} \right] \frac{n}{8\pi^2 \, M_{e^-} \, f_a} \qquad \#26$$

The reduction of the factors within the brackets **[ ]** produced Planck's constant. Plank's constant emerged as a dependent variable. The result (27) is the well-known formulation for the amplitude of harmonic motion. The derivation of (27), using paradoxical quantum substitutions, is difficult and takes up a significant portion of a class in quantum mechanics. This author produced (27) from the algebraic union of two short equations. His solution is universal. It applies both to the quantum jumps between an atom's inner states and to the classical motion of the atom's outer electrons. No principle of correspondence is required. The probability of transition varies with the square of the amplitude, $\mathbf{r_a}^2$. The intensity of a spectral emission varies directly with this probability. Perhaps (27) should be renamed to the amplitude of the conserved transitional vibrations.

$$r_a^2 = \frac{nh}{8\pi^2 M_e\text{-}f_a} \qquad \#27$$



The intensity of a group of spectral lines

The frequency of a classical wave is that of its emitter. Equation (27) shows that the frequency of an emitted photon is that of the transitional atomic vibration $\boldsymbol{f_a}$. The intensity of a classical wave varies with the square of its amplitude. The number (not the energy or the voltage) of emitted photons varies with the square of the transitional matter wave's amplitude $\mathbf{r_a}$. The simultaneous emergence of both the photon's frequency and the matter wave's amplitude is fundamental to and replaces Bohr's principle of quantum correspondence.

The strength of the expelled electromagnetic, nuclear spin orbit, and gravitomagnetic forces increases with the square of the amplitude of the vibration $\mathbf{r_a^2}$. Inertial mass is reduced as the gravitomagnetic flux is decoupled from the core of matter. The probability of a transition increases as the velocities converge and impedance of the fields is matched. The intensity of the light emitted by a bound electron is proportionate to the probability of transition. Time is metered through the action of these probabilities. The intensity of a spectral emission appears as a consequence

of a universal convergence in the magnetic motion constants.

Theoretical Cold Fusion

A low energy nuclear reactor (LENR) is constructed of palladium or nickel. Hydrogen is driven into the metal. The dissolved hydrogen is not bound. It is, however, confined at the extent of the nano-particle. The metallic lattice naturally resonates at thermal frequencies (10^{12} hz). This vibration is enhanced with heat, laser light, or radio waves. Nanometer scaled domains couple strongly with the external stimulation.[35]

Typically, vibration destroys superconductivity. This author's analysis has shown that vibration, at a dimensional frequency of one megahertz-meter, enhances superconductivity[36]. This effect was experimentally confirmed at the max Planck institute in 2014.[41]

> "*Terahertz-frequency (10^{12} hz) optical pulses can … induce superconductivity*".
>
> Roman Mankowsky, The Max Planck Institute[41]

Vibration can reinforce an electronic condensate and induce warm, above room temperature, superconductivity. The vibration can also adjoin non-bound protons to the condensate. In the gravitomagnetic devices, a lower frequency radio frequency of vibration (10^{6} hz) is transferred to the loosely-bound heavy nucleons that rest between the layers of a superconductive disk. These vibrationally reinforced condensates are a new state of matter. This composite state is reminiscent of J.J. Thompson's "plumb pudding" model of matter.

Low energy thermal vibration has a high energy effect at the scale of these condensed nano-domains. The stimulation imposes a speed of 1,093,850 meters across a cluster of nucleons. The action drives the electromagnetic, gravitomagnetic, and the nuclear magnetic spin orbit force to the surface of the nano-domain. The system enters into a state of continuous quantum transition. "*The constants of the motion tend toward those of the electromagnetic*" and the reaction proceeds.

A notation was used to describe the motion of a standing wave in (9). The quantification of this motion produced several well-known results. Equation

(9a) will now show a new result.

$$Y = cos\left(\frac{2\pi}{\lambda}x\right) sin(n\omega_{e\text{-}}t) \qquad \#9a$$

The isolated electron resonates at the highest possible frequency; its Compton frequency $\boldsymbol{f_c}$. The angular frequency $\boldsymbol{\omega_{e\text{-}}}$ was quantified with the Compton frequency of the electron ($\mathbf{2\pi f_c}$). The Compton frequency of a condensate, like that of a chime, varies inversely its length. Harmonics of the angular frequency appear in (29) at fractions (**1/n)** of the fundamental frequency.

The electronic wave number $\mathbf{r_p}$ emerged from the refactoring of Coulomb's equation. The dissolved hydrogen is confined at the extent of the condensate ($\mathbf{nr_p}$). This extent was used to set the length of the wave number. These conditions were inserted into (9) resulting in (29).

$$Y = cos\left(\frac{2\pi}{nr_p}x\right) sin\left(\frac{2\pi f_c}{n}t\right) \qquad \#29$$

As solution of (29) (again the angular frequency divided by the wave number) produced the electronic speed in (30). Equation (30) is an identity as both sides of the equation contain independent constants. A factor of **2π** was injected into the right side of the solution as the longitudinal motion of the dissolved hydrogen follows the transverse motion of the electronic cloud. The normal speed of sound in a solid is about 6000 m/s. This speed arises as each nucleon interacts with its nearest neighbor. The speed expressed in (30) acts across the length of the nano-particle. This speed, like that of a tidal wave, greatly exceeds the speed of sound in a solid. Dr. Edmund Storms

and Dr. Michael Mckurby have found that the metal must be highly loaded with dissolved hydrogen. The resulting pressure increases metal's natural frequency from 10^{12} to 10^{13} hz. This is the frequency of the intense, warm thermal stimulation. Mobile nucleons enter into a state of quantum a transition as the speed $\mathbf{S_n}$ (1,093,850 meters per second) is imposed. This high speed is difficult to achieve, however, it appears that the low energy nuclear speed is much more accessible than the hot fusion temperature.

$$S_n = \left(\frac{2\pi f_c}{n}\right)(nr_p) \qquad \#30$$

The concept that a superconductor downshifts the frequencies of matter, was first proposed by Dr. David Noever at the Marshall Spaceflight Center. He explained it to me during my visit at Marshall in 1997. This author applied this idea to the Compton frequency of a condensate. The first term, on the right side of (30), expresses the downshifted Compton frequency of a condensate of electrons. This term qualifies the relationship that Noever was looking for. With **n** set to one there is no downshift and the frequency is the Compton frequency of the electron $\boldsymbol{f_c}$ (10^{20} hz). With **n** set to ten to sixth power the downshifted frequency is in terahertz (10^{13} hz). This is the frequency, of the thermal vibration, that stimulates a low energy nuclear reaction. With **n** set to ten to the ninth power the downshifted frequency is in megahertz (10^{6} hz). This is the frequency, of the radio waves, used in Podkletnov's gravitational experiments.

The second term, on right side of (30), describes the length ($\mathbf{nr_p}$). With **n** set to one, the length is the half classical radius of the electron. This is the length expressed by the electron's wave number (12). With **n** set to ten to sixth power, the length is in nanometers. This is the length of the active low

energy nuclear environment. With **n** set to ten to ninth power, the length is in meters. This was the diameter of Podkletnov's superconductive disk.

The protons dissolved within a proton conductor vibrate in unison and energetically appear as one large nucleus. Dr. George Miley has called the cluster a compound nucleus. An intense stimulation forces the nano-particles to act like a laser on steroids. The magnetic, gravitomagnetic, and nuclear spin orbit forces are expelled to the surface of the nano-cluster. These forces act, from the surface of the cluster, upon millions of nucleons. The range of the magnetic nuclear spin orbit force (acting from the surface of a nano-particle) exceeds the range of a nucleon's electrostatic charge. The action matches the impedance of the electronic lattice to that of a cluster of nucleons.

This match allows the nuclear cluster to smoothly exchange energy with the electronic lattice. No high energy radiation is emitted by the smoothly acting process. The ease, at which the cluster can be driven to transition, is proportional to amplitude of the vibration squared.

The application of this process will lead to the control of all of the natural forces. The effect appeared as a miracle and, as such, it should be taken as a gift of the natural universe.

CHAPTER 7 Mysteries Resolved

The Photo Electric Effect

Max Planck introduced the quantum and, with it, produced the emission spectrum of a hot blackbody. As a conventional physicist Planck struggled to find a classical explanation for these spectral emissions. Over one hundred years later, the emergence of new observables, has exposed one. The quantization of energy emerges as an effect of a classical impedance match. Energy flows, without bounce, and one photon is emitted. This author's impedance matched interpretation of quantum physics was defined by an equality in speed (31). The speed of the longitudinal matter wave $\mathbf{S_n}$ equals $\mathbf{2\pi}$ times the speed of a transverse electrical wave. The frequency of a traveling wave has no harmonics **n**. This speed is that of a quantum jump.

$$S_n = 2\pi f_a \lambda_a \qquad \#31$$

The frequency of the emitted photon does not match the frequency of any stationary atomic state. As expressed in his letter, Rutherford was puzzled by this. The photon's frequency, does however, match the frequency of the transitional atomic state $\boldsymbol{f_a}$. The energy of a photon emerges as a result of the interaction of an electrical charge and the radius $\boldsymbol{\lambda_a}$. The simultaneous emergence of both the photon's frequency and its energy is fundamental to Bohr's principle of complementarity. In combination, these affects reconcile the wave-like and particle-like duality of light.

Albert Einstein, Paul Langevin, Ernest Rutherford, and Max Planck, among others, searched for a classical explanation for the photo electric effect. After

a century of looking, none was ever found. In the late 20th Century Znidarsic discovered the speed of sound within a matter wave (11 &31). The conserved components of the wavefunction collapse at a speed of 1,093,850 meters/second. Energy is conserved and collapses at this velocity. The none-conserved compont's of the wavefunction instantaneously collapse. The magnetic fields are not conserved and can instantaneously collapse. Einstein stated that the instantaneous component, of the collapse of the matter wave, appeared like a "*Spooky interaction at a distance.*"

The isotropic capacitance $\boldsymbol{C}$ of a sphere, of radius $\boldsymbol{\lambda_a}$ was given in (32). Capacitance is a geometric function. The non-conserved components of light wave instantly collapse upon this geometry during transition. The charge radius of the electron decreases as the energy accumulates. At the radius of matching impedance $\boldsymbol{\lambda_a}$ the bubble bursts and energy flows at the speed $\mathbf{S_n}$. The radius of matching impedance is unknown.

$$C = 4\pi e_o \lambda_a \qquad \#32$$

Equation (31) demonstrates that the energy of the transitional quantum state propagates at the velocity $\mathbf{S_n}$. The radius $\boldsymbol{\lambda_a}$, like the length of an antenna, couples the frequency $\boldsymbol{f_a}$ to the velocity $\mathbf{S_n}$. The solution (33) of equations (31) and (32) expresses the radius $\boldsymbol{\lambda_a}$ of in terms of the frequency $\boldsymbol{f_a}$. This frequency is that of an interacting light wave. $\boldsymbol{f_a}$. It is observable. This frequency appears at radii $\boldsymbol{\lambda_a}$ of matching impedance. The conserved components of the light wave interact at the radius of matching impedance.

$$C = \frac{2e_o S_n}{f_a} \quad \#33$$

The energy contained by an electrical charge was expressed in terms of its capacitance in (34).

$$Energy = \frac{Q^2}{2C} \quad \#34$$

Equation (34) shows that the energy of the electric field varies inversely with capacitance. The voltage produced by an electrical charge increases as its capacitance decreases. The energy of the photon is proportional to the amplitude of this voltage (Power α ExH). This relationship is fundamental to and replaces Bohr's principle of complementarity.

The simultaneous solution of (33) & (34) produced (35). Equation (35) gives the energy of a light wave as a function of its frequency.

$$Energy = \left[\frac{Q^2}{4e_o S_n}\right] f_a \qquad \#35$$

Plank's constant emerged as the terms within the brackets **[ ]** were reduced. The result, (36), is Einstein's famous photo-electric equation. It shows that the energy of an emitted photon varies linearly with its frequency f_a. The speed of interaction $\mathbf{S_n}$ is an independent natural constant. This speed has remained hidden, as a term within Planck's constant, for over a century.[38] The radius $\boldsymbol{\lambda_a}$ is expressed in terms of the other constants and it does not directly appear in the solution. The photo-electric effect (36) emerges with the action of these classical terms.

$$Energy = hf_a \qquad \#36$$

Energy flows at points were the speed of sound (a longitudinal mechanical wave) equals the speed of light (a transverse electrical wave). Energy flows are observable. The photon appears as an observable effect of this energy flow. The action of light, at other points, is that of a wave. These waves are observed indirectly with the appearance of many photons. The energy of a photon is a classical function of its amplitude. This amplitude is measured in volts. The frequency of the emitted photon f_a is that of the transitional quantum state. The frequency and the energy of the photon emerged, from speed, within a framework of Newtonian mechanics.

The Fine Structure Constant

Coulomb's equations (1&2) describe the electromagnetic force. The factors, of his equations, were used by Maxwell and the speed of light, in a vacuum, **c** was produced.

$$c = \sqrt{\frac{1}{e_0 u_0}}$$

Znidarsic's equations (3&4) also describe the electro-magnetic interaction. The sonic nuclear speed $\mathbf{S_n}$ emerged with use of equations (3&4). The domain, of this speed, was extended to non-nuclear systems in (30). Energy moves between the harmonics, of a bound matter wave, at the speed $\mathbf{S_n}$. The speed of hydrogen's ground state electron $\mathbf{2S_n}$ emerged with the interaction a standing and a traveling wave. The ratio of the speed $\mathbf{2S_n}$ to that of light **c** was expressed below.

$$\alpha = \frac{2S_n}{c}$$

The origin and meaning of the fine structure constant has been a long

standing mystery. Richard Feynman stated,

"*Physicists put this number up on their wall and worry about it*."

The fine structure constant **α** emerged as the ratio was reduced. The fine structure constant emerged as twice the ratio of the sonic to the luminal speed.

The DeBroglie Wave

In 1924 Louis deBroglie published his thesis, "Recherches sur la théorie des quanta" (Research on the quantum theory). DeBroglie suggested that matter has wave like properties. The experiments of Davisson and Germer subsequently confirmed this hypothesis.[42] The length of the deBroglie wave varies inversely with its mass and velocity.

$$\lambda_d = \frac{h}{Mv}$$

The deBroglie wave is a curious construct. It shrinks and swells with speed, it has no classical analog, and it is interpreted to be only a mathematical abstraction of probability. Schrödinger incorporated deBroglie's wave into his wave equation. It was said that Schrödinger's equation is what it is and that it cannot be reduced to fundamental terms. Despite these difficulties, Schrödinger's wave was accepted because it produced results. It describes most of physics and all of chemistry.

Louis deBroglie suggested that his wave is a real. He said that a beat note emerged from a superposition of the electron's Compton wave and its Doppler shifted reflection. The wavelength of the beat note is that of matter's deBrogle wave. The electron's Compton wave could not be produced from any fundamental analysis. There was no surface upon which to reflect the Compton wave. The result required matter to propagate at light speed. DeBroglie's beat note hypothesis was not well founded and it was promptly rejected.

This author has produced the Compton frequency of the electron $\boldsymbol{f_c}$ from an

analysis of an elastic constant and a wave number. This analysis has shown that the Compton vibration is that of a real classical wave.

$$f_c = \frac{1}{2\pi}\sqrt{\frac{F_m / r_h}{M_{e^-}}}$$

The magnetic field can be attached to a magnet or it may fly away at light speed within a photon. What binds the force fields into the structure of matter? A professor explained that more advanced courses were required to address this question. Undeterred, this author noted that magnetic fields were pinned into superconductors through the introduction of defects (discontinuities). A discontinuity emerged from the spring like refactoring of Coulomb's equation. Discontinuities pin the force fields into the structure of matter and they provide a reflective surface.

The phase speed of the Compton vibration is luminal **c**. The propagation of this luminal mode is restrained by an elastic discontinuity. A beat in the Compton vibration emerges as an elastic discontinuity drags the Compton vibrations along at the group speed **v**. The wavelength of the beat note is that of matter's deBroglie wave. Schrödinger's equation is not fundamental. It depends upon this classical action.

A good analogy, for the motion, is that of an imaginary very stiff bell. The size of the bell's clevis is that of the elastic discontinuity $\mathbf{r_p}$. A point-like electric charge is confined within the bounds of the discontinuity. Like an electric charge within a conductive sphere, the charges location, within a discontinuity, is also hidden. This amount uncertainty equals that given by the Heisenberg Uncertainty Theorem. The electron's Compton wave propagates in the metal, of the bell, at the luminal speed. The electron's deBroglie wave emerges, as a beat note, with the bell's swing.

The magnetic moment of the electron also appears as a consequence of this action. The radius of the electron's spin rests at points where the group speed equals light speed.

The deBroglie wave was developed, as the consequence of a beat note, in the paper "The Constants of the Motion". This paper was published in "The Journal of New Energy" in the fall of 2000[36]. This result and the Heisenberg relationship were also published in papers at the "The General Science Journal".

This author's arguments establish a classical foundation for the quantum condition. These concepts can be applied across the entire quantum realm and they can be extended to all of the natural forces. The field of quantum physics is vast. This compilation would take several lifetimes to complete. Only the most fundamental, of these arguments, were developed within this introductory text.

Special Relativity

Einstein's theory of Special Relativity applies to the continuous properties of matter. The quantum condition applies to the individual particles of matter. The theory of Special Relativity and quantum theory have not been easily reconcilable.

An elastic constant and a wave number emerged from a refactored Coulomb's equation. These classical terms were inserted into equation (9). The result described the standing wave of the electron. The motion of mass energy is standing. This motion is similar to that of a mass bouncing on a spring. When a spring is drawn tight the potential energy is at a maximum and the kinetic energy is zero. One quarter of a cycle later (90 degrees later) the spring is relaxed and the kinetic energy is at a maximum. The phase **φ** of a standing wave is 90 degrees. Matter's mass energy (**Mc^2**) was represented by a vertical vector along the **y** axis of a phase plain. Refer to the plot on page 126.

Equation (5) introduced the traveling wave. The wave number and the elastic constant were inserted into (5). The result gave the speed of the orbiting electron. The motion is similar that of the water's surf. The kinetic and potential energies flow in lock step along the surface. The traveling component of matter's mass energy was placed on the **x** axis of a phase plain (**φ**=zero degrees). Contemporary constructs describe two sources of momentum; that of moving matter **Mv** and that of flowing energy **E/c**. Matter's momentum **P** appeared as the flow of mass energy **E** was reduced by light speed **(P=E/c)**. Classical dynamics appears as an effect of this flow of mass energy. Matter's kinetic energy, for example, equals the integral of the resultant momentum with respect to velocity. This author's construct has revealed that there is only one source of momentum.

The vector sum **($x^2+y^2=z^2$)** of the standing **x** and traveling **y** energies equals the length of the hypotenuse **z**. The length of the hypotenuse represents matter's relativistic energy.

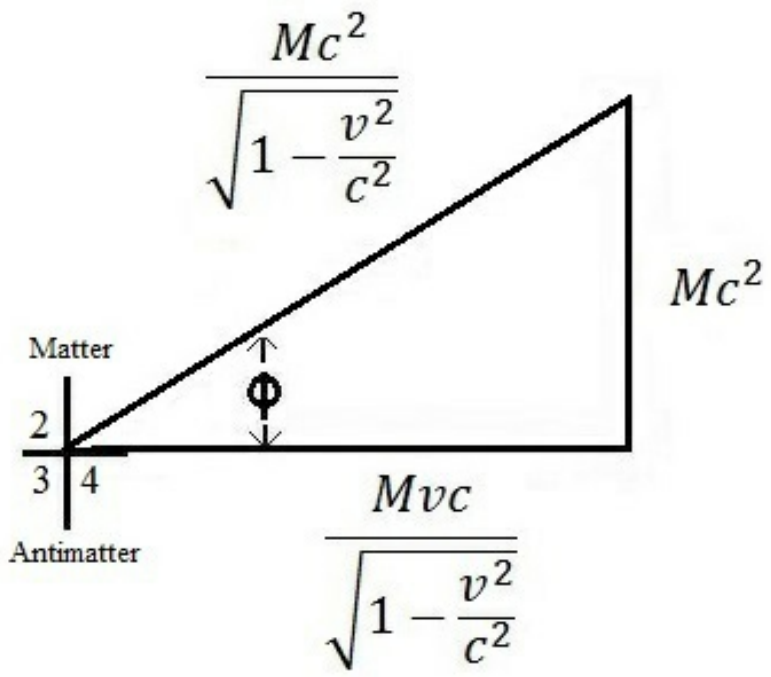
An “impedance matched” interpretation of quantum physics emerged along with an elastic constant and wave number. This interpretation describes the real, classical motions of the matter wave. The elastic constant describes the motion that oscillates with respect to time. This motion was shown along the **y** axis of a phase plain. The wave number describes the motion that undulates with respect to position. This motion was shown along the **x** axis of a phase plain. Time dilates as the positional motion gains influence.

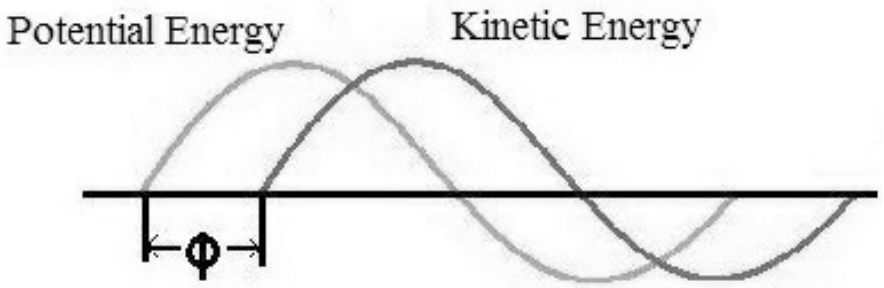
The ratio of standing energy (along the **y** axis) to the relativistic energy (along the hypotenuse) reduces to:

$$\mathbf{(1-v^2/c^2)^{-1/2}}$$

The ratio is known as the gamma function **(γ)**. It expresses the properties of Special Relativity. The arc sin of this ratio is the phase **φ**. The phase **φ** quantifies the separation of matter’s potential and kinetic energy. Matter contracts as the separation of its potential and kinetic components decreases. This effect is associated with speed. It is known as the Lorentz contraction.

The phase **φ** expresses the displacement of the potential and the kinetic components of the matter wave. The phase **φ** of the matter wave determines its relativistic momentum, mass, time, and length. These effects reconcile Newtonian Physics, quantum physics, and Special Relativity.





The angle between the potential and the kinetic energy

The Standing and the Traveling Waves of Matter

This author's analyses began with a mathematical description of a standing and a traveling wave. The properties of Special Relativity appeared with the superposition of these motions. The properties of Special Relativity emerged, within a framework of Newtonian mechanics, as a consequence of the real motions of the matter wave.

The cosine of the phase **φ** expresses the power factor of an electrical power line. The power factor is the ratio of the flowing energy (measured in watts) to the standing energy (measured in vars). The magnetic reactance of a power system is not conserved and can be canceled. Freewheeling synchronous motors are sometimes attached to a power line in order to cancel the magnetic reactance of a power line. The process reduces the phase **φ** and increases the power factor of the line. Similarly, the inertial mass of moving matter is also not conserved. If a strong gravitomagnetic field can be induced by a rotating, vibrating superconductive disk, an induced gravitomagnetic field, of the opposite handedness, may be employed to cancel the impetus of mass energy.

The inertia of matter varies inversely with its phase **φ** of its mass energy. An induced gravitomagnetic field will approach the spacecraft as its phase **φ** increases.

Matter's inertial mass is zero at a phase **φ** of 90 degrees. Under this condition, the matter's induced gravitomagnetic field will travel with the spacecraft. This matter will propagate at the luminal velocity.

Matter's inertial mass becomes negative at angles within the second and the third quadrants of the phase plain. Under this condition, the induced gravitomagnetic field will travel ahead the spacecraft. Matter appears to travel in reverse under this condition. Superluminal speeds add a second time reversal. Can a mass with a negative inertia travel at or faster than the speed of light without going backwards in time? The action of an entangled state may take a similar route.

This author's refactored Coulomb's equation (3) describes a force. This force

has both a magnitude and a direction. Force is a Newtonian quantity. Equation (4) was produced as a result of the integration of Equation (3). Equation (3) describes an energy. This energy has a magnitude but it does not have a direction. Energy is a scalar quantity. A reason that this author used Equation (3) is because scalar computations are simpler. The direction of a force does not have to be vectored into the solution. Quantum physicists simplify their quantifications in a similar fashion. They use Hamiltonian operators. These operators have no force or direction. They are scalar. Schrödinger's wave equation is scalar.

The properties of Relativity do not spontaneously emerge from these scalar operations. This author's Equation (3) shows that mass energy is restrained at elastic discontinuities. The properties of Special Relativity and the deBrogle wave emerged from an analysis of the group velocity of a restrained, standing wave.[39]

A force is produced as matter's energy attempts to escape from grip of an elastic discontinuity. The static gravitational field of matter is induced in opposition to this force.[40] The properties of both Special and General Relativity emerge, from vectorial Newtonian mechanics, as a consequence of the restraint of the matter wave.

A force is produced as matter's energy attempts to escape from grip of an elastic discontinuity. The static gravitational field of matter is induced in opposition to this force.[40] The properties of both Special and General Relativity emerge, from vectorial Newtonian mechanics, as a consequence of the restraint of the matter wave.

CHAPTER 8 Conclusion

Coulomb's equations quantified the strength and the energy of an electrical field. Maxwell extended Coulomb's equations and determined the speed of light. Planck's constant ***h*** was the oddball. It did not emerge from Maxwell's formulations. It is empirical. Planck's constant was injected, ad-hoc, into a description of quantum reality. It was assumed that Newtonian mechanics exists within a subset of this reality.

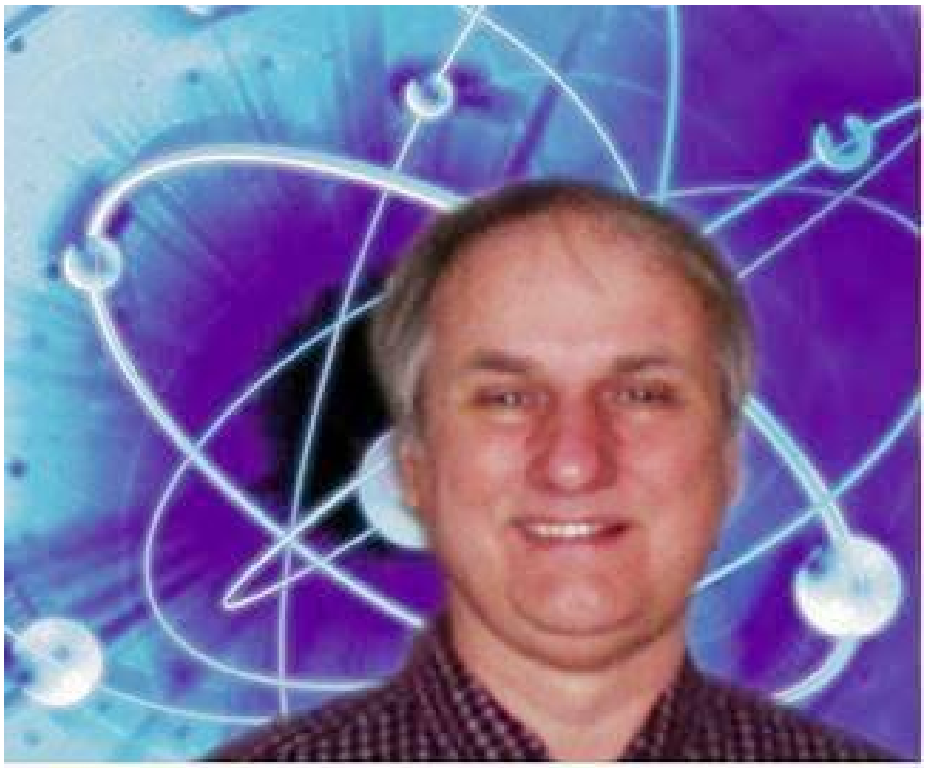
Znidarsic refactored Coulomb's equation into the form of a spring. His construct also quantified the strength and the energy of an electrical field. A wave like elastic constant $\mathbf{K_e}$- and a particle like elastic discontinuity $\mathbf{r_p}$ emerged as terms within the refactored equation. The length $\mathbf{2r_p}$ was used to set the wavelength $\boldsymbol{\lambda}$ of the electrical field's wave number $\mathbf{(2\pi/\lambda)}$. The speed of the atomic electrons emerged as a classical effect of this elastic constant and wave number.

The process of low energy nuclear reactions and the process of strong gravitomagnetic induction have been held in distain. A speed was observed during these experiments. This speed corresponds with the speed of sound in the nucleus. Planck's constant emerged from an equality in the nuclear and atomic speeds. This emergence demonstrated that the quantum condition exists, as a subset; within a framework of Newtonian mechanics. The analysis produced the energy and the frequency of the photon. It also provided an explanation for the deBroglie wave and demonstrated a possible reconciliation of quantum physics and Relativity. An extension of the analysis determined the probability of transition. Time flows along with the probability of transition.

Taken alone, each result can be refuted. Taken together, the model is sufficiently robust, within its domain, to make reliable predictions. An interpretation, of the result, shows how to the control of all of the natural forces. The technologies that arise, from this understanding, will be remarkable.

The process of vibration may adjoin the nucleons, within a superconductor or

proton conductor, into a new state of matter. This state is one of a continuous quantum transition. Trillions of atoms will be adjoined into a single state of transition. Strong, local gravitomagnetic effects will emerge. The use of these strong gravitomagnetic forces will propel space craft to the stars. Long range nuclear spin orbit magnetic effects will emerge. These nuclear-magnetic forces will be used to reduce nuclear waste and to supply an unlimited amount of clean nuclear energy. Man may be on the verge of harnessing all of the natural forces. These technologies will change the type of our civilization. I hope that this happens soon.



ABOUT THE AUTHOR

Frank Znidarsic is a registered professional Electrical Engineer in the state of Pennsylvania. He graduated, in 1975, with a B.S. in Electrical Engineering from the University of Pittsburgh. In 1987, he went on to obtain an A.S. in business administration from Saint Frances College. He studied physics at the Indiana University of Pennsylvania in the late 1990s. He has worked in industry for 32 years. He has personally witnessed the decline of American manufacturing as his position has been downsized or outsourced at least four times. He has been told more than once, "As one door closes another opens."

Frank has written peer reviewed and non-peer reviewed articles on low energy nuclear reactions, antigravity, and physics. These works have shown a way to produce limitless quantities of energy. They have also shown how to propel spacecraft to the stars. The emergence of these technologies, along with the continuous development of computer science, will lead to a future age of abundance. Frank believes that low level jobs will be lost to automation and that new, exciting opportunities will emerge with our cosmic expansion. Frank hopes that the introduction of this book will expedite the next technological revolution.

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NOMENCLATURE

BTU =3412 kilowatt-hour

c = 299,792,458 meters/second. Light speed

f_a = The atomic frequency

$f_c = 1.236 \times 10^{20}$ Hertz, The Compton frequency of the electron

$F_m = 29.0535$ Newtons, The maximum force of the electron

$G = 6.67 \times 10^{-11}$ The gravitational constant

$h = 6.625 \times 10^{-34}$ joules-seconds Planck's constant

$K_{e^-} = F_m/r$ Newtons/meter, The elastic constant of the electron

$K_f = 1.35969 \times 10^{-15}$ meters , The nuclear spacing

$M_{e^-} = 9.109 \times 10^{-31}$ kg, The mass of the electron

$M_p = 1.6726 \times 10^{-27}$ kg, The mass of a proton

n = 1,2,3,4,5.., an integer

$Q = 1.60218 \times 10^{19}$ Coulombs, The electric charge

r_a = The atomic radius

$r_p = 1.40897 \times 10^{-15}$ meters, The radius of a particle; The maximum range of the strong force.

$2r_p = 2.81794 \times 10^{-15}$ meters, The classical radius of the electron

$r_h = .529 \times 10^{-10}$ meters, The radius of the hydrogen atom

$S_n = 1{,}093{,}850$ meters per sec., The speed of sound in the nucleus

S_a = The speed of an atomic electron

Z = 1,2,3,…, The number of protons in the nucleus

THEOREMS

1. The constants of the motion tend toward the electromagnetic in a Bose condensate that is vibrated at a dimensional frequency of 1,093,850 meters per second.
2. The impedance matched interpretation of quantum physics states that **2πn** times the speed of a transitional electron equals a harmonic **Z** of the fundamental nuclear speed $\mathbf{S_n}$.
3. Bosons bounce.
4. Fermions fail.

PARTIAL BIBLOGRAPHY

1. I. Bernard Cohen, Henry Crew, Joseph von Fraunhofer, De Witt Bristol Brac, "The Wave theory, light and Spectra", Ayer Publishing, 1981
2. Robert Bunsen, "article", Journal of the American Chemical Society, Volume 22, 900
3. L Hartmann, Johann Jakob Balmer, "Physikalische" Blätter 5 (1949), 11-4
4. W. Ritz, "Magnetische Atomfelder und Serienspektren", Annalen der Physik, Vierte Folge. B and 25, 1908, p. 660–696.
5. Planck Max, "On the Law of the Distribution of Energy in the Normal Spectrum", Annalon der Physik, Vol. 4, p 553, (1901).
6. Einstein Albert, "Development of our Conception of the Nature and Constitution of Radiation", Physikalische Zeitschrift 22, (1909)
7. Bohr Niels, "On the Constitution of Atoms and Molecules", Philosophical Magazine, Series 6, Vol. 26, pp 1-25 (1913)
8. Maxwell James Clerk, "A Dynamical Theory of the Electromagnetic Field", Philosophical Transactions of the Royal Society of London, Vol. 155, (1865)
9. Louis deBroglie, "Recherches sur la théorie des quanta" (Researches on the quantum theory), Thesis, Paris, 1924
10. Max Born, "The Statistical Interpretation of Quantum Mechanics", Nobel Lectures, 1964
11. A Einstein, B. Podolsky, and N. Roses, "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete", Phys. Rev. 47, 777 - 780 (1935)
12. Miley George H., "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis", 2nd International Conference on Low Energy Nuclear Reactions, (1996).
13. Mosier-Boss, Szpak S., Gorden F.E. and Forsley L.P.G., "Use of CR-39 in Pd/D co-deposition Experiments", European Journal of Applied Physics, 40, 293-303, (2007)
14. Storms Edmond, Cold Fusion, A Challenge to Modern Science, The Journal of Scientific Exploration, Vol 9, No. 4, pp 585-594, (1995)
15. Rothwell Jed, Infinite Energy, Issue 29, p 23. (1999) "50 nano-meters ..is the magic domain that produces a detectable cold fusion reaction"
16. Arata Y. and Fujita H., Zhang Y., "Intense deuterium nuclear Fusion of Pycnodeuterium-Lumps Coagulated Locally within highly Deuterated Atomic Clusters", Proceedings of the Japan Academy, Vol. 78, Ser.B, No.7 (2002)
17. Li Ning and Torr D.G., "Gravitational effects on the Magnetic Attenuation of Superconductors", Physical Review B, Vol 46, #9, (1992)
18. Reiss Harrald, Anomalies Observed During the Cool-Down of High Temperature Superconductors, Physics Essays, Vol. 16, No. 2 (June 2002).
19. Tajmar M., deMathos C, "Coupling of Gravitational and Electromagnetism in the Weak Field approximation", Cornell
20. 20. Podkletnov E. and Levi A.D., "A Possibility of Gravitational Force Shielding by Bulk YBa2Cu307-x, Superconductor", Physica C, vol 203, pp 441-444 (1992).
21. http://www.scribd.com/doc/39624178/Podkletnov-2001-Paper-with-Giovanni-Modanese
22. Papaconstantopoulus D. A. and Klein B. M., "Superconductivity in Palladium-Hydrogen Systems", Phys. Rev. Letters (July 14, 1975)
23. M. Modarres, "Momentum Distributions of Nuclear Matter" , 987 Europhys. Lett. 3 1083
24. A. Sommerfeld, "Principles of the Quantum Theory and the Bohr Atomic Model", Naturwissenschaften (1924), 12 1047-9

25. Richard Feynman, "The Strange Theory of Light and Matter, (1988)
26. The Lex Foundation, "What is Quantum Mechanics", (1996)
27. For over 2,000 papers on cold fusion; LENTR.ORG
28. Matthew R. Simmons; "Twilight in the Desert"
29. "The Elastic Limit and the Quantum Condition", The General Science Journal
30. Todd Tucker, "Atomic America", 200930. Richard Rhodes, "The Making of the Atomic Bomb", (1986)
31. Sean Carroll, "From Eternity to Here", Pgs 178, 242
32. Ernest Rutherford letters to Neils Bohr, Yale University Press, page 68, (1938)
33. Charles P. Poole, "Superconductivity", Pg. 4 (2007)
34. Independent tests of Rossi's device indicate anomalous energy. http://arxiv.org/abs/1305.3913
35. Mark L. Stockman, "Nanoplasmonics, The Physics Behind the Applications", Physics Today, (2/ 2011)
36. Frank Znidarsic, "The Constants of the Motion", The Journal of New Energy, Vol 5. No 2, Sept 2000 & http://www.padrak.com/ine/NEN_5_11_12.html
37. I. Sick ; "Precise Radii of Light Nuclei from Electron Scattering," Springe-Verlag (2008). http://www.sjsu.edu/faculty/watkins/He4nuclide.htm
38. BELL, Department of Physics, University of Wisconsin, Madison, ON THE EINSTEIN PODOLSKY ROSEN PARADOX, Physics Vol. 1, No. 3, pp. 195-290, 1964
39. R C Jennison, Relativistic phase-locked cavities as particle models, Journal of Physics A: Mathematical and General, Volume 16, Number 15, 1983
40. F. Znidarsic, Force and Gravity, Infinite energy, Issue 22,October-November 1998
41. Many authors, Nonlinear lattice dynamics as a basis for enhanced superconductivity, Nature, Vol. 516, Issue 7529, 2014 http://www.nature.com/nature/journal/v516/n7529/full/nature13875.html#ref8

ADDITIONAL READING

Frank Znidarsic, "The Quantum Condition and an Elastic Limit"; Bentham Open Chemistry Journal, ISSN: 1874-8422 , Volume 1, 2014

Check out my apps: MIDI Staff, Monitoring-MIDI, Video Selfie Start/Stop, Parrot Teacher, and The Dreams Alarm Clock, at Amazon and Google.